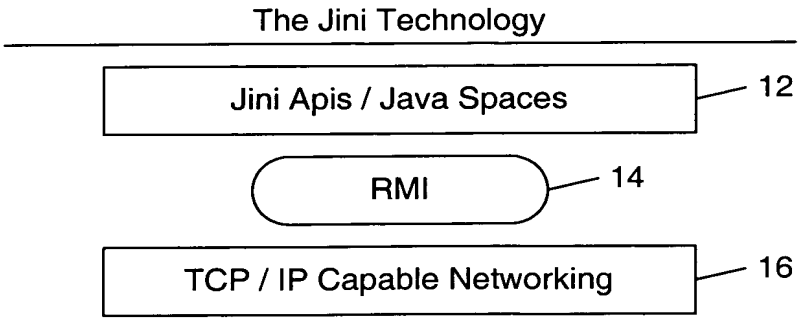


Fig. 1
(Prior Art)

09650562 - 091208

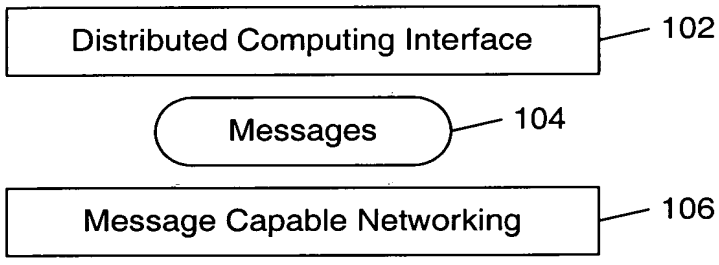


Fig. 2

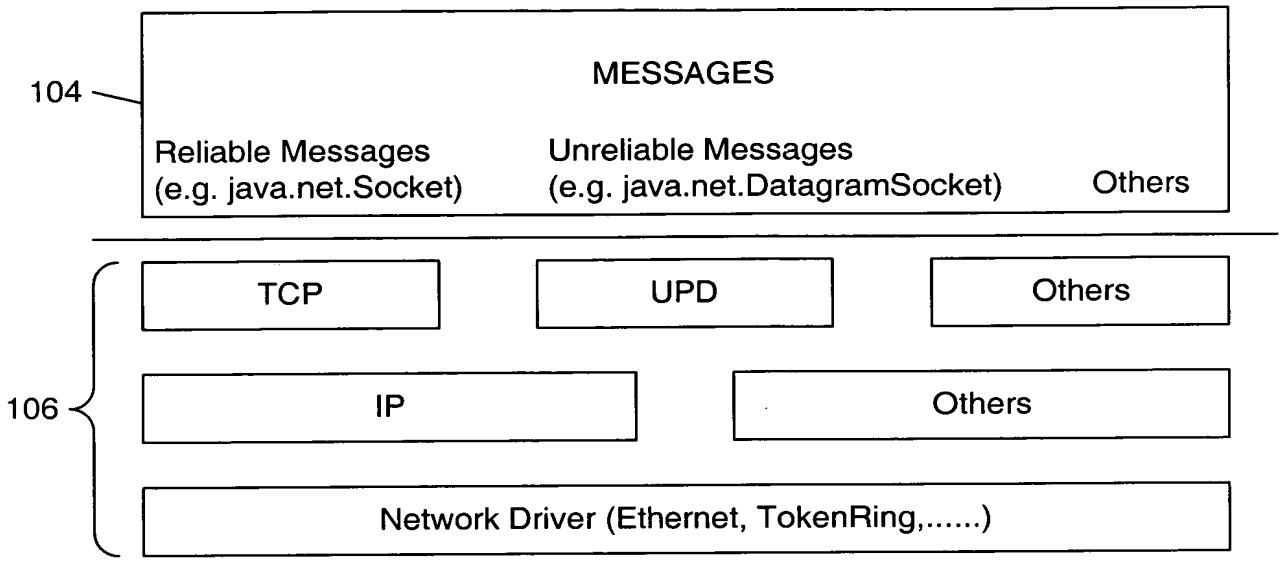

104
MESSAGES
Reliable Messages
(e.g. java.net.Socket)
Unreliable Messages
(e.g. java.net.DatagramSocket)
Others
106
TCP
UPD
Others
IP
Others
Network Driver (Ethernet, TokenRing,.....)

Fig. 3

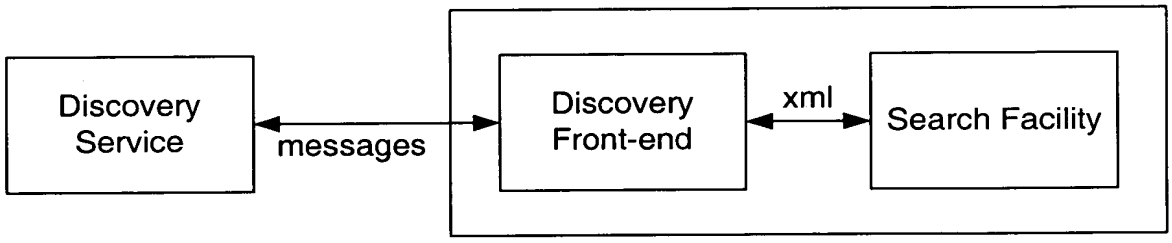

Discovery
Service
messages
Discovery
Front-end
xml
Search Facility

Fig. 4

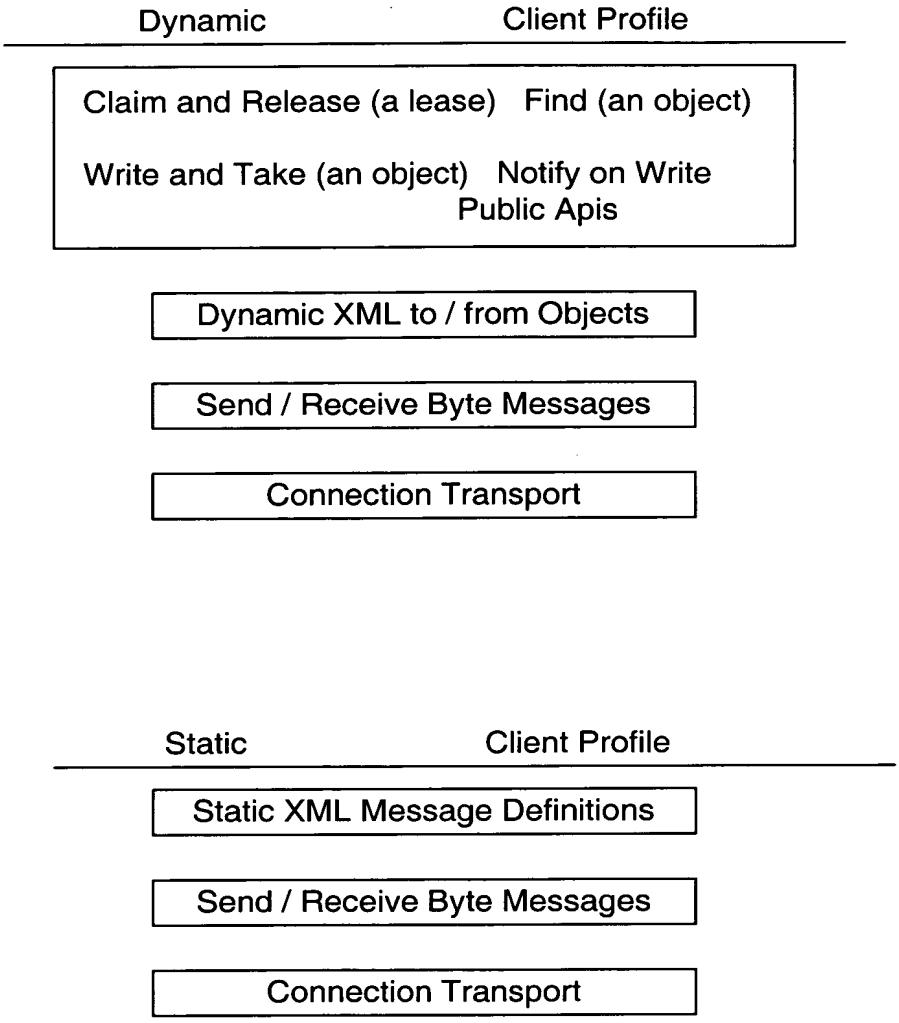


Fig. 5

09656562.030200

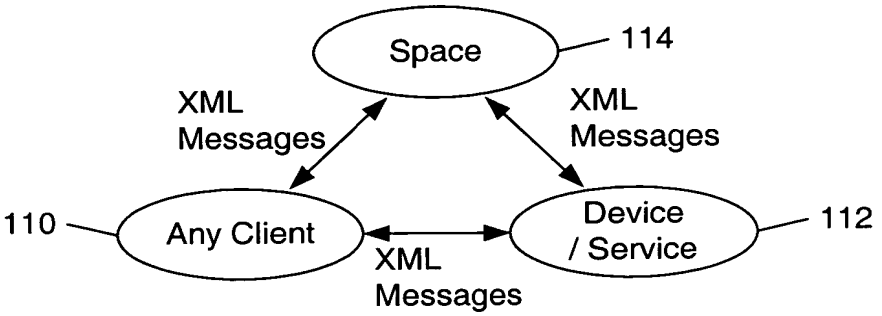

Space
114
XML
Messages
XML
Messages
110
Any Client
Device
/ Service
112
XML
Messages

Fig. 6

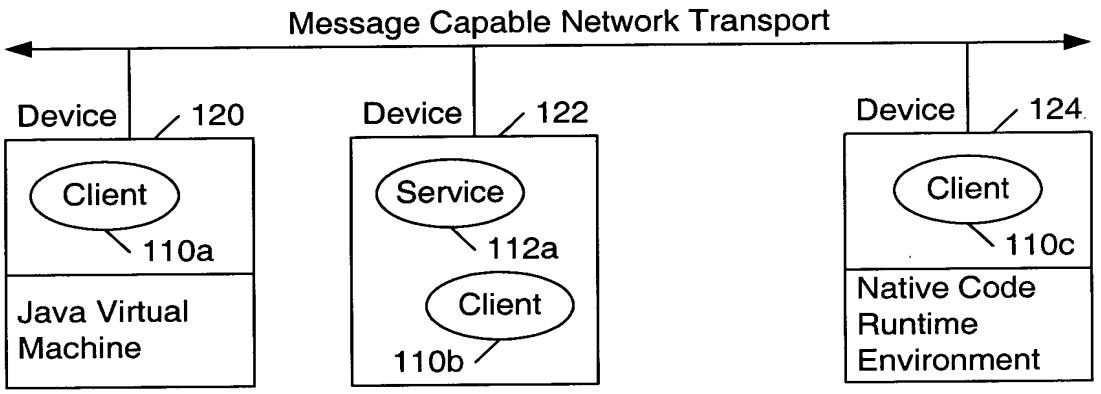

Message Capable Network Transport
Device
120
Client
110a
Java Virtual
Machine
Device
122
Service
112a
Client
110b
Device
124
Client
110c
Native Code
Runtime
Environment

Fig. 7

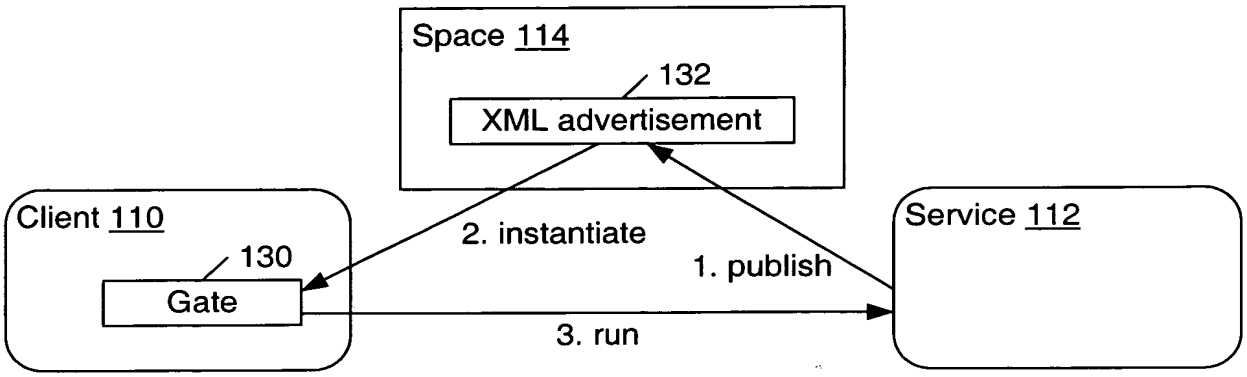


Fig. 8

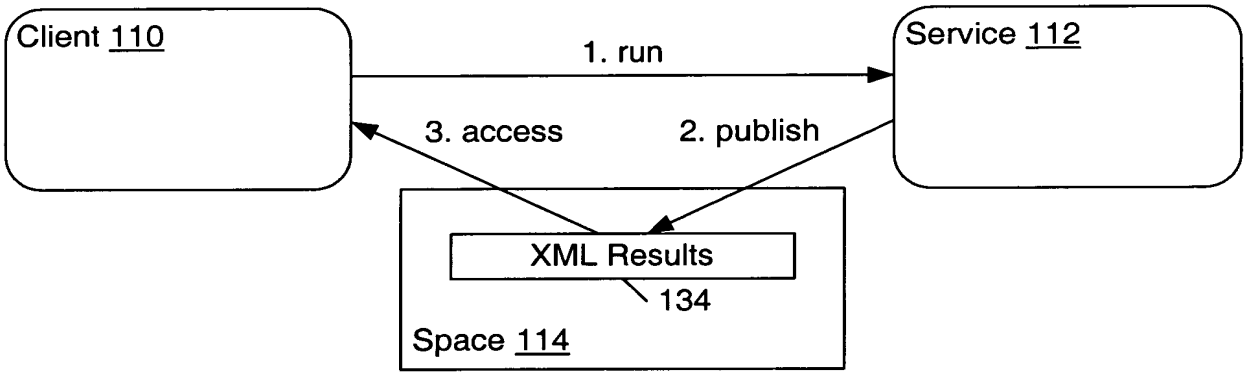


Fig. 9

09605562 - 032200

9606506.03420

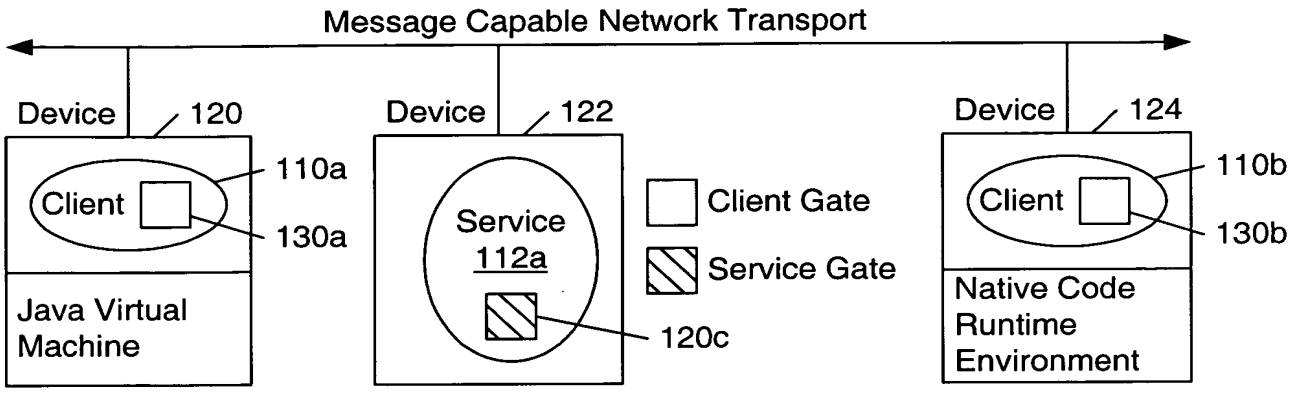


Fig. 10a

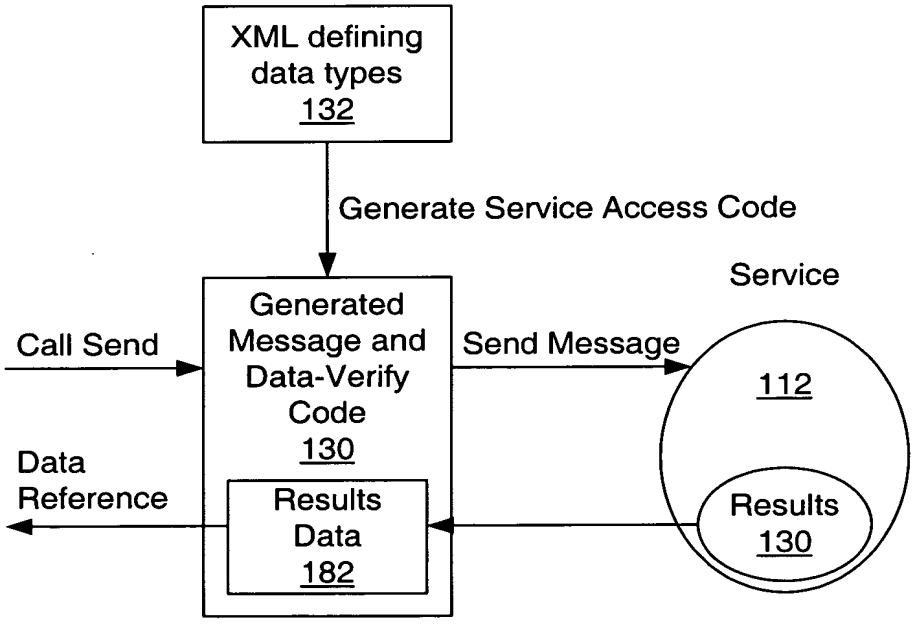


Fig. 10b

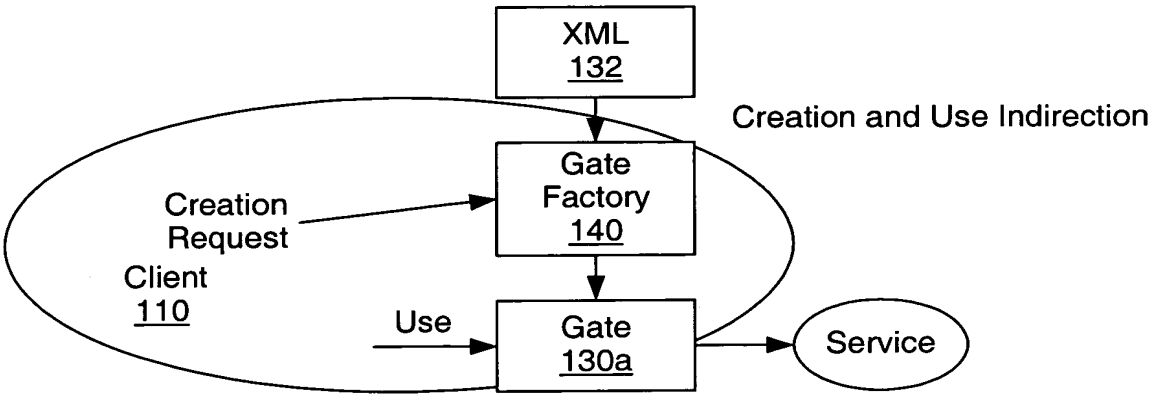


Fig. 11a

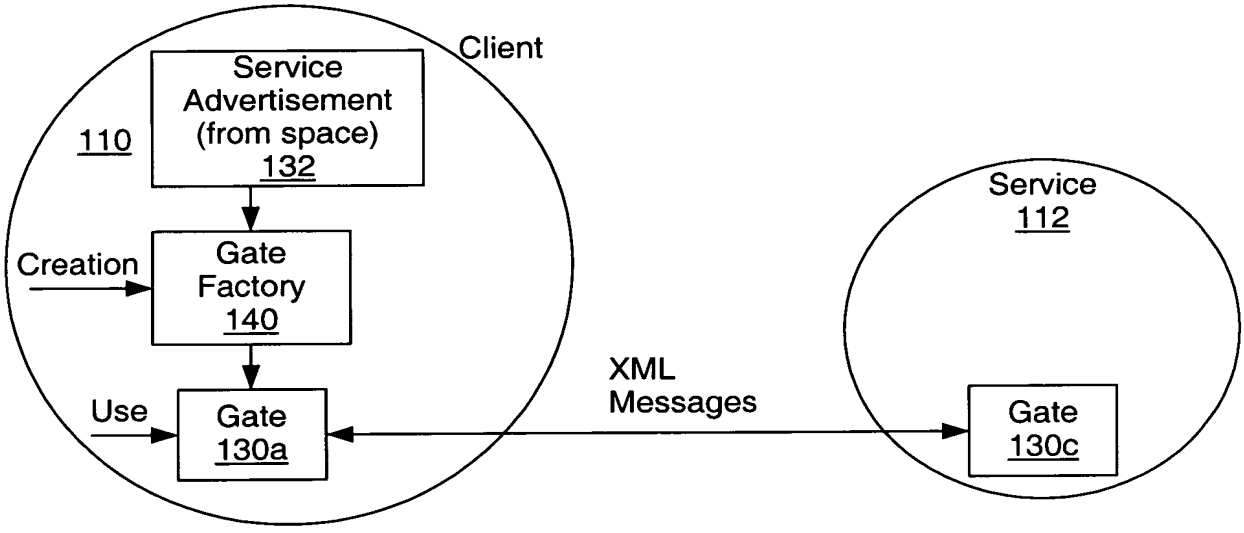


Fig. 11b

0960560.09220

09656562 - 031203

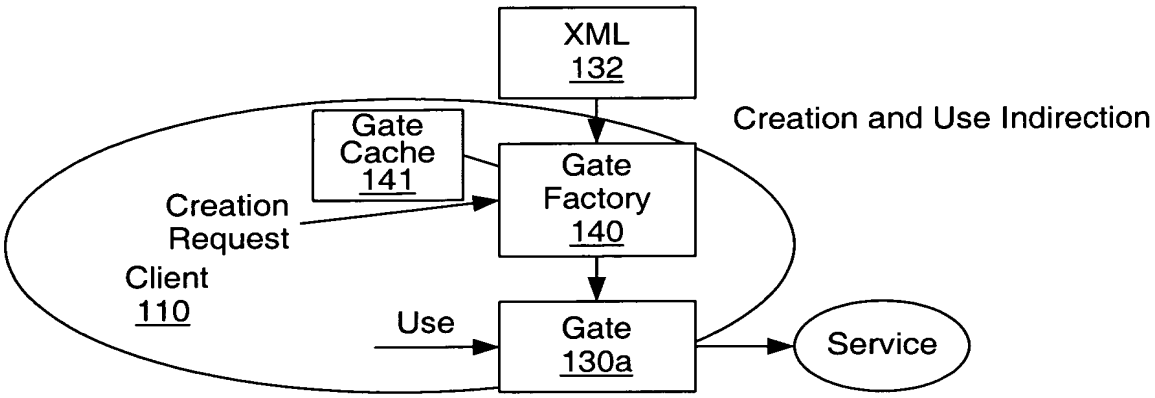


Fig. 11c

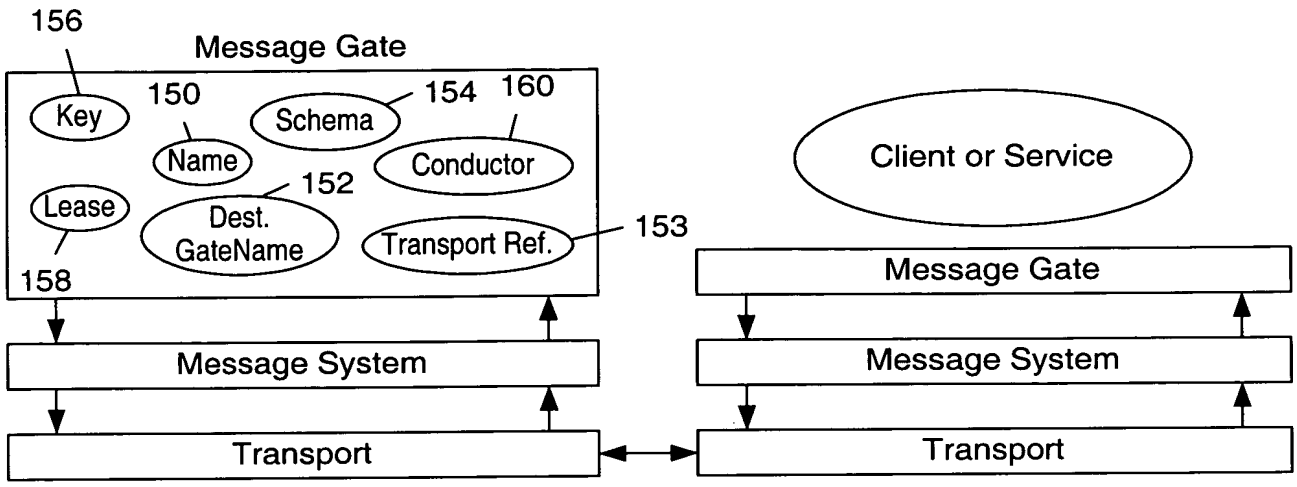


Fig. 12

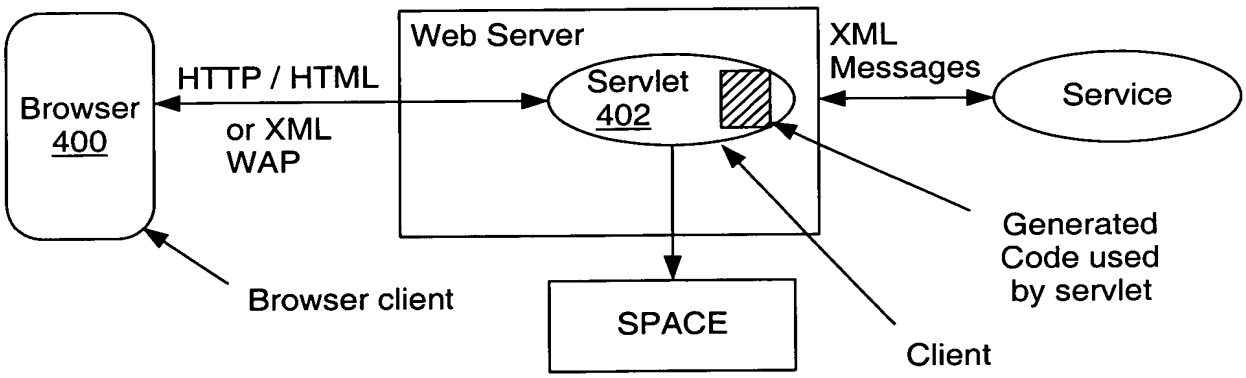


Fig. 13

09605502 - 091200

09605502 - 091200

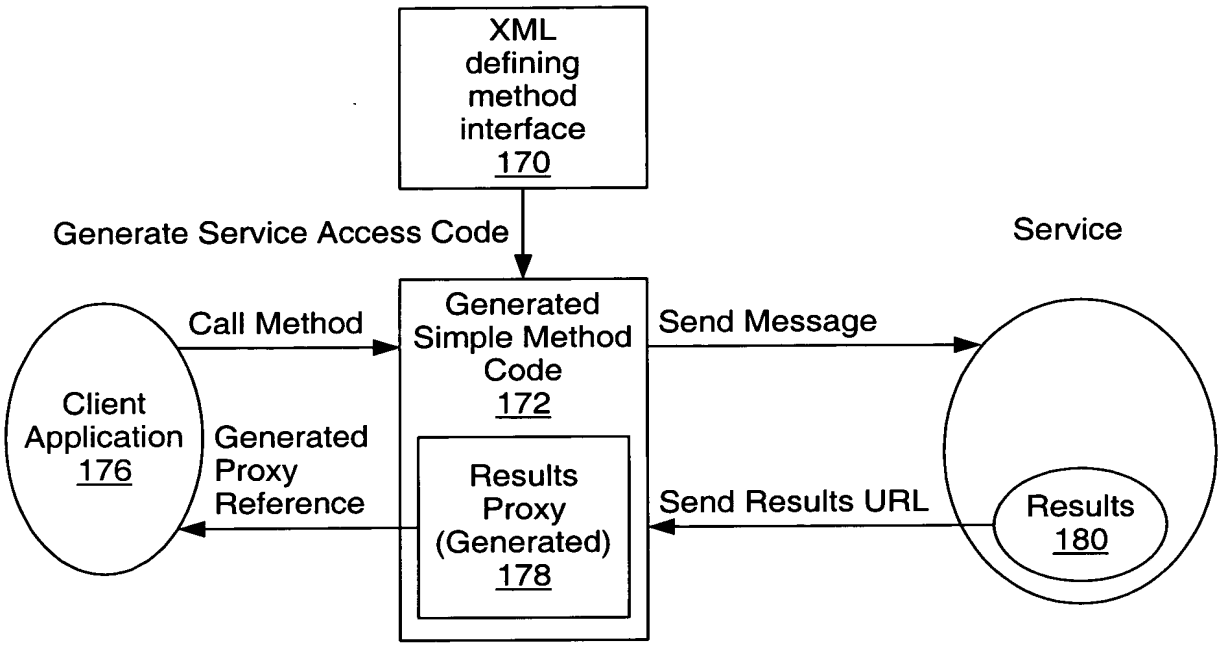


Fig. 14

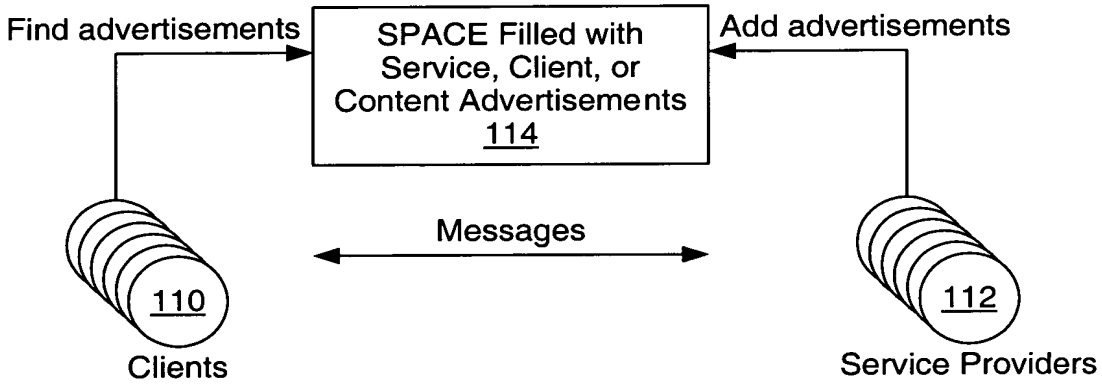


Fig. 15

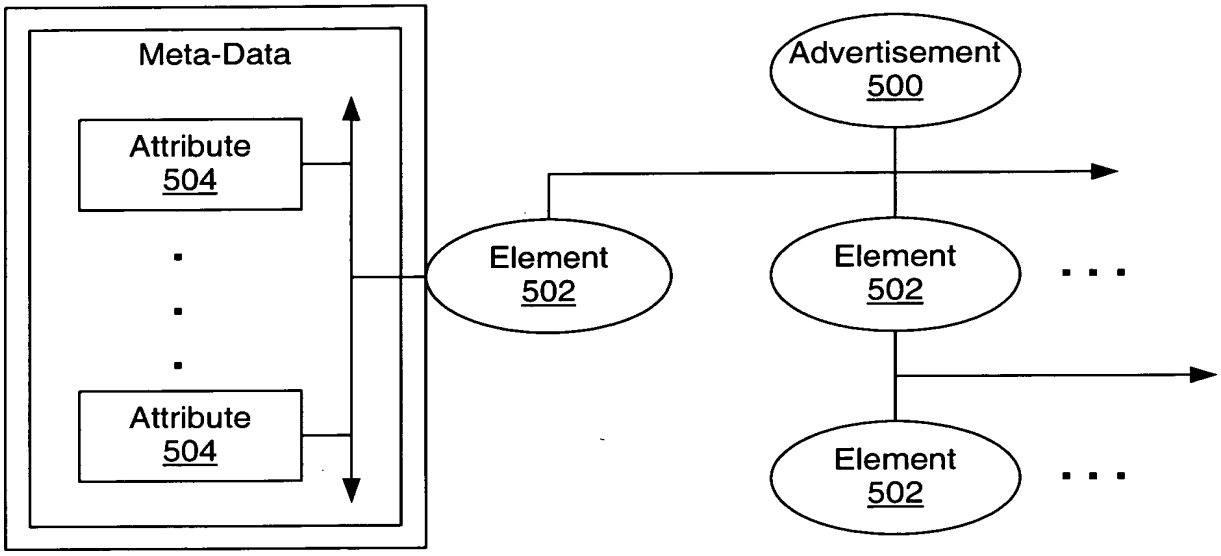

Meta-Data
Attribute
504
Attribute
504
Advertisement
500
Element
502
Element
502
Element
502

Fig. 16

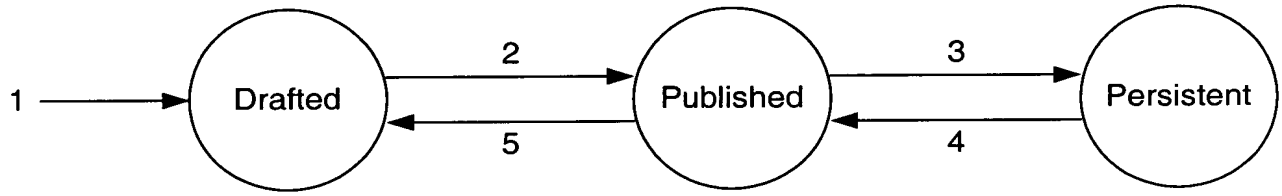

1
Drafted
2
5
Published
3
4
Persistent

Fig. 17

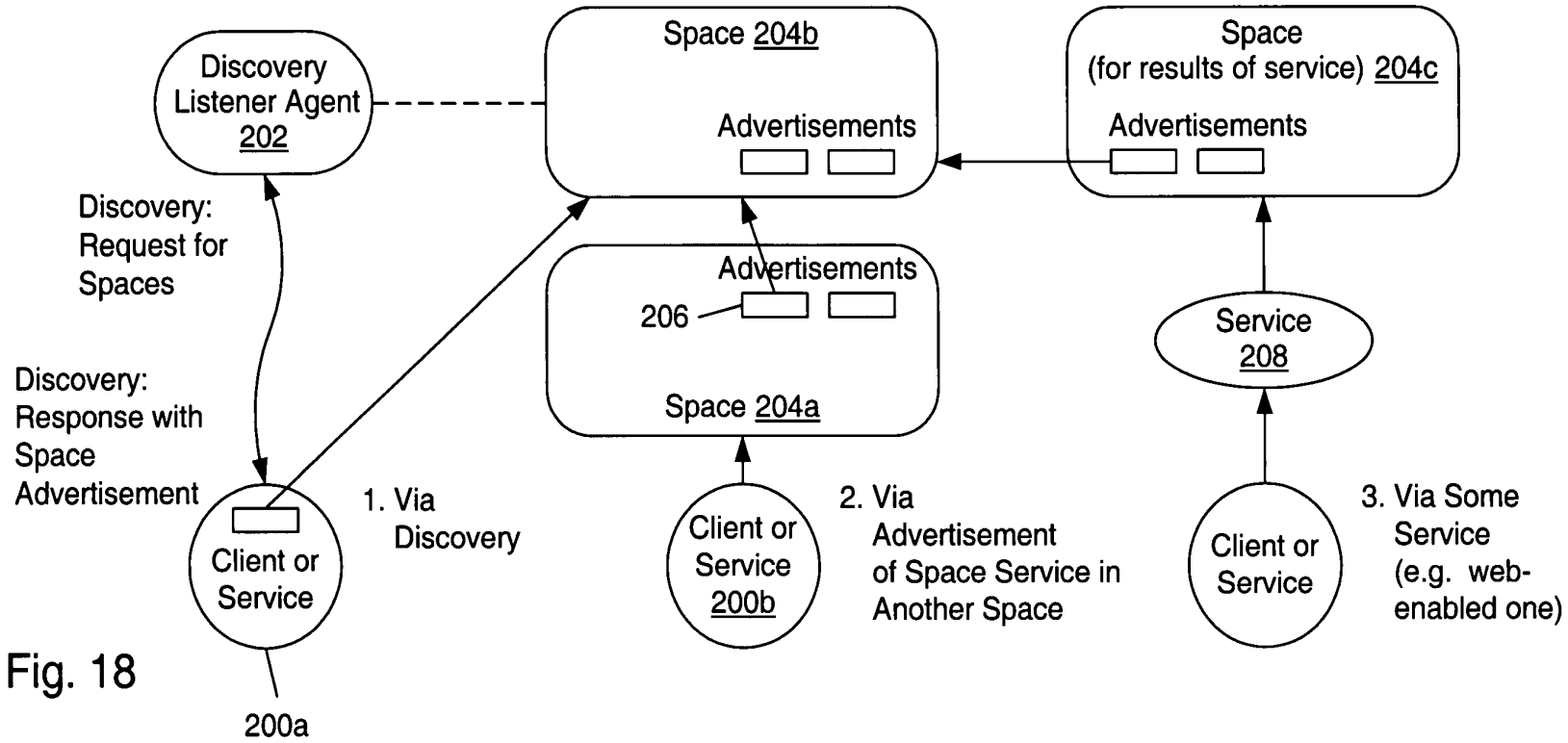

Discovery Listener Agent 202
Space 204b
Advertisements
Space (for results of service) 204c
Advertisements
Discovery: Request for Spaces
Advertisements
206
Space 204a
Service 208
Discovery: Response with Space Advertisement
1. Via Discovery
Client or Service
Client or Service 200b
2. Via Advertisement of Space Service in Another Space
Client or Service
3. Via Some Service (e.g. web-enabled one)
200a

Fig. 18

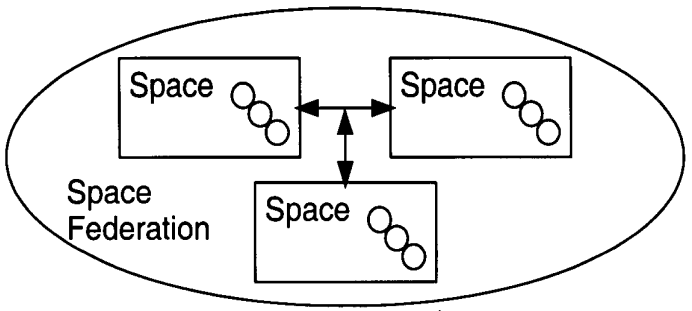

Space
Space
Space Federation
Space

Fig. 19

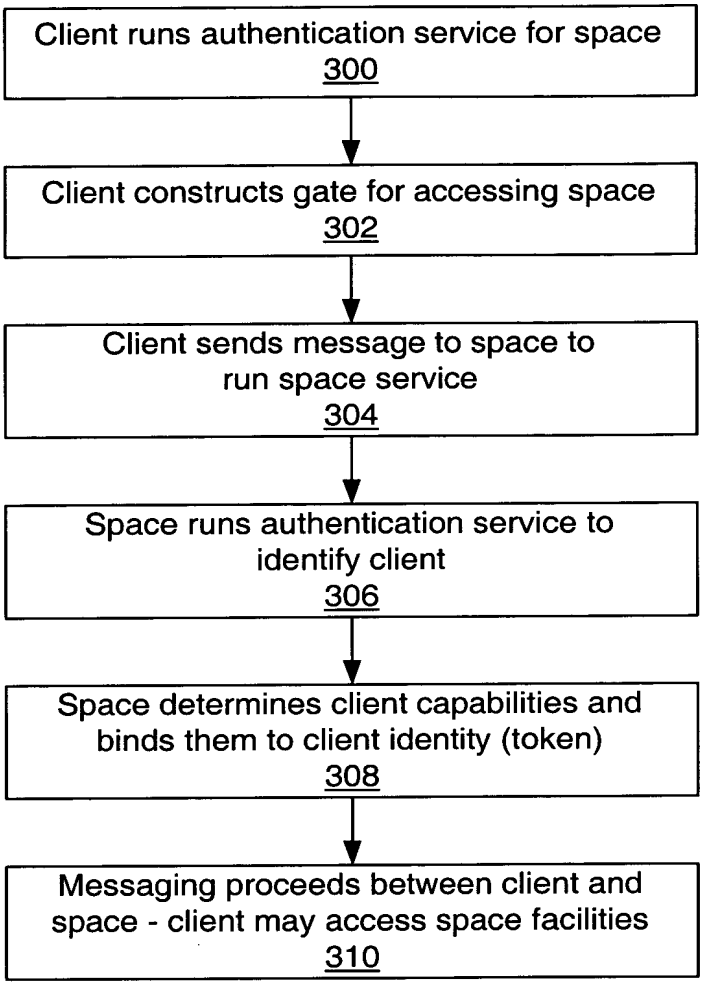

Client runs authentication service for space
300
Client constructs gate for accessing space
302
Client sends message to space to run space service
304
Space runs authentication service to identify client
306
Space determines client capabilities and binds them to client identity (token)
308
Messaging proceeds between client and space - client may access space facilities
310

Fig. 20

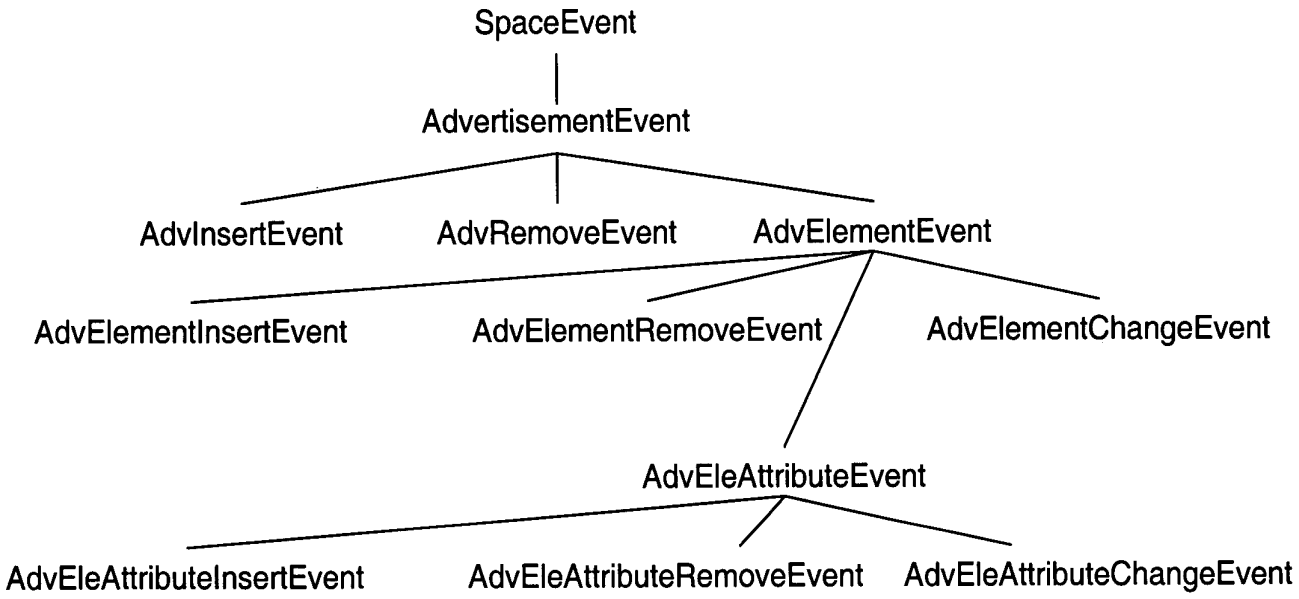

SpaceEvent
AdvertisementEvent
AdvInsertEvent
AdvRemoveEvent
AdvElementEvent
AdvElementInsertEvent
AdvElementRemoveEvent
AdvElementChangeEvent
AdvEleAttributeEvent
AdvEleAttributeInsertEvent
AdvEleAttributeRemoveEvent
AdvEleAttributeChangeEvent

Fig. 21

09605562 - 031200

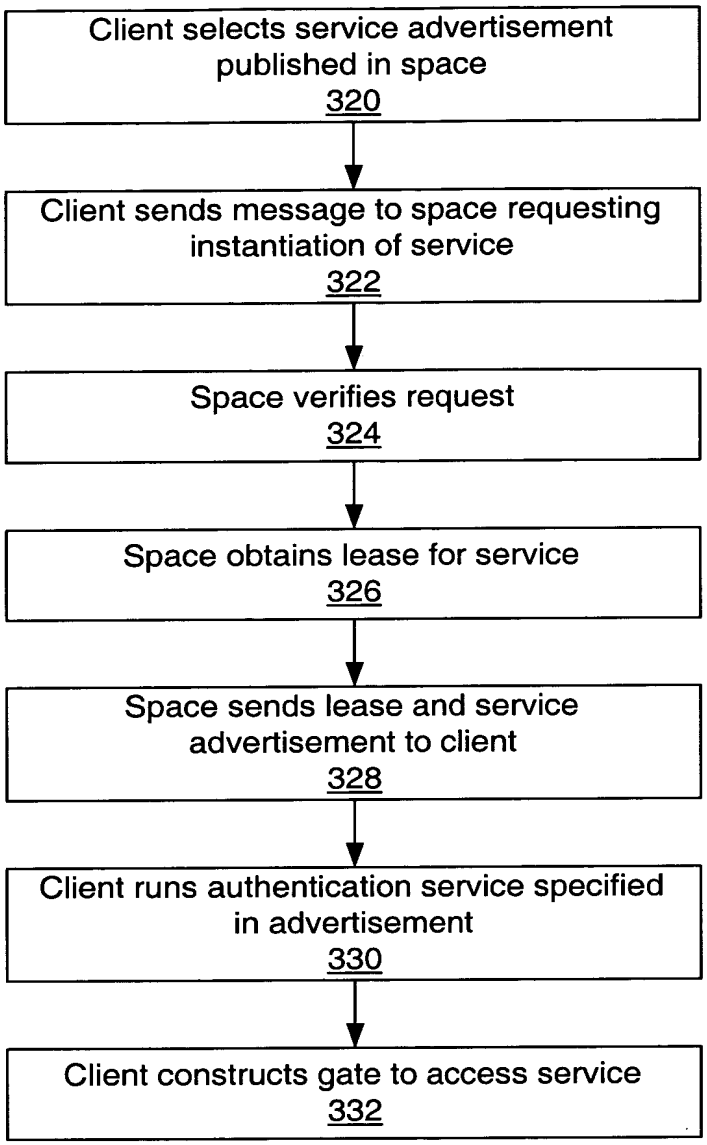


Fig. 22

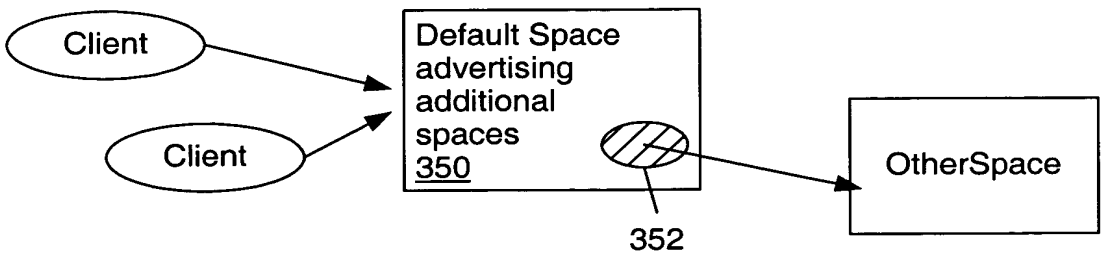


Fig. 23

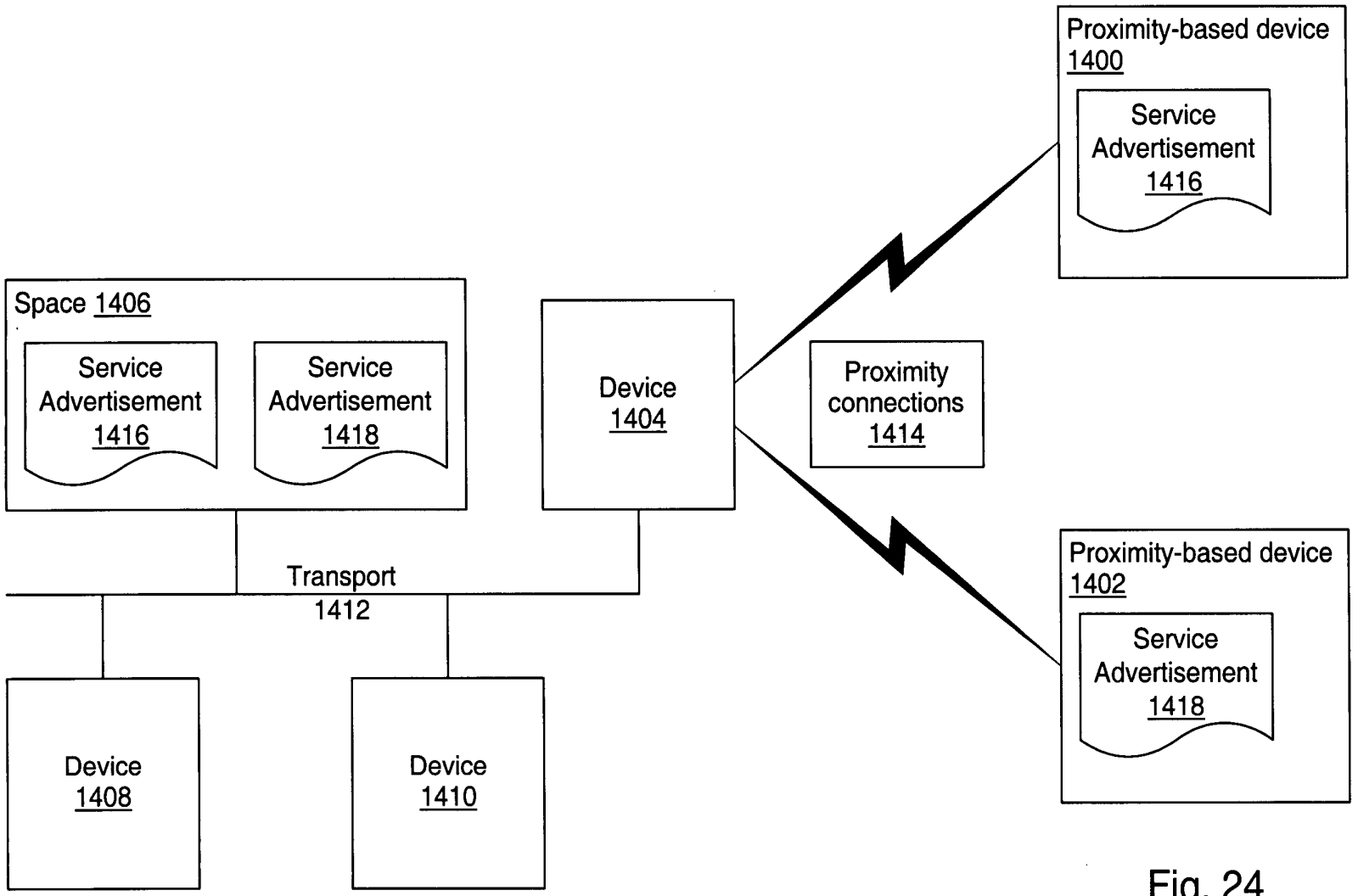

Proximity-based device
1400
Service
Advertisement
1416
Space 1406
Service
Advertisement
1416
Service
Advertisement
1418
Device
1404
Proximity
connections
1414
Transport
1412
Proximity-based device
1402
Service
Advertisement
1418
Device
1408
Device
1410

Fig. 24

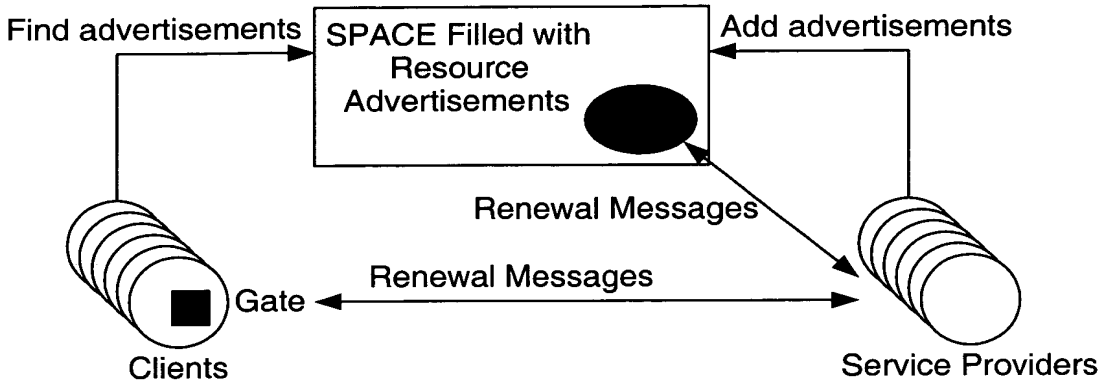


Fig. 25

09660562 . 051200

05605252.052200

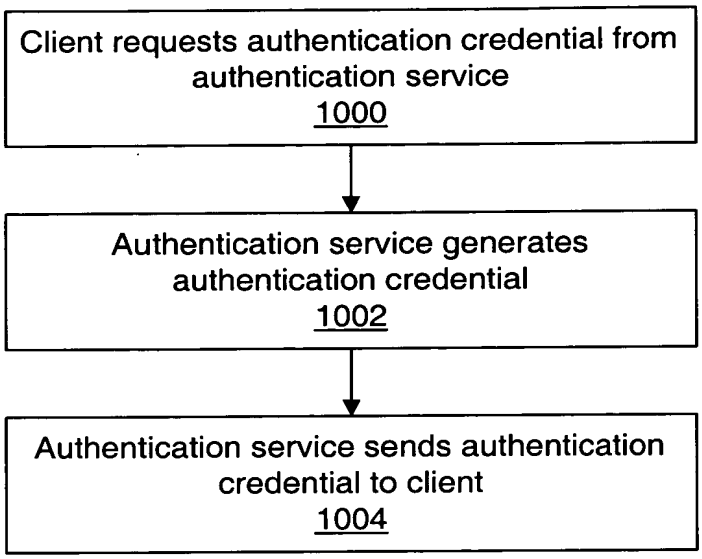


FIG. 26a

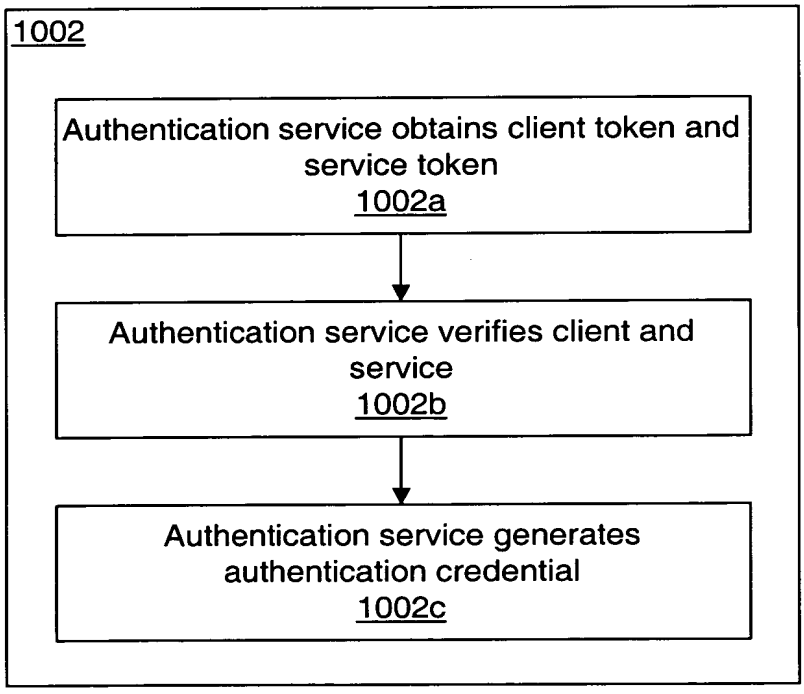


FIG. 26b

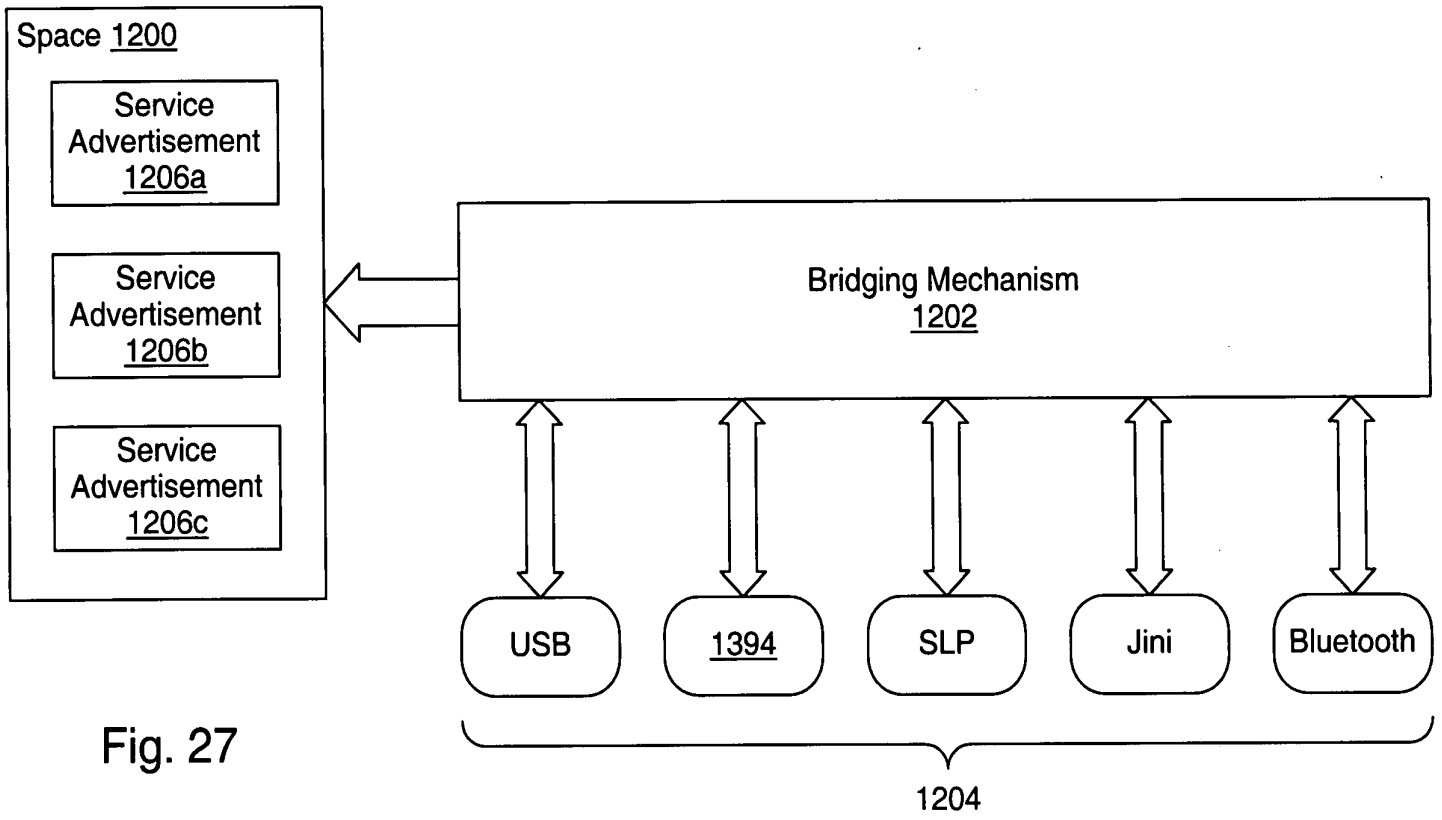

Space 1200
Service Advertisement 1206a
Service Advertisement 1206b
Service Advertisement 1206c
Bridging Mechanism 1202
USB
1394
SLP
Jini
Bluetooth
1204

Fig. 27

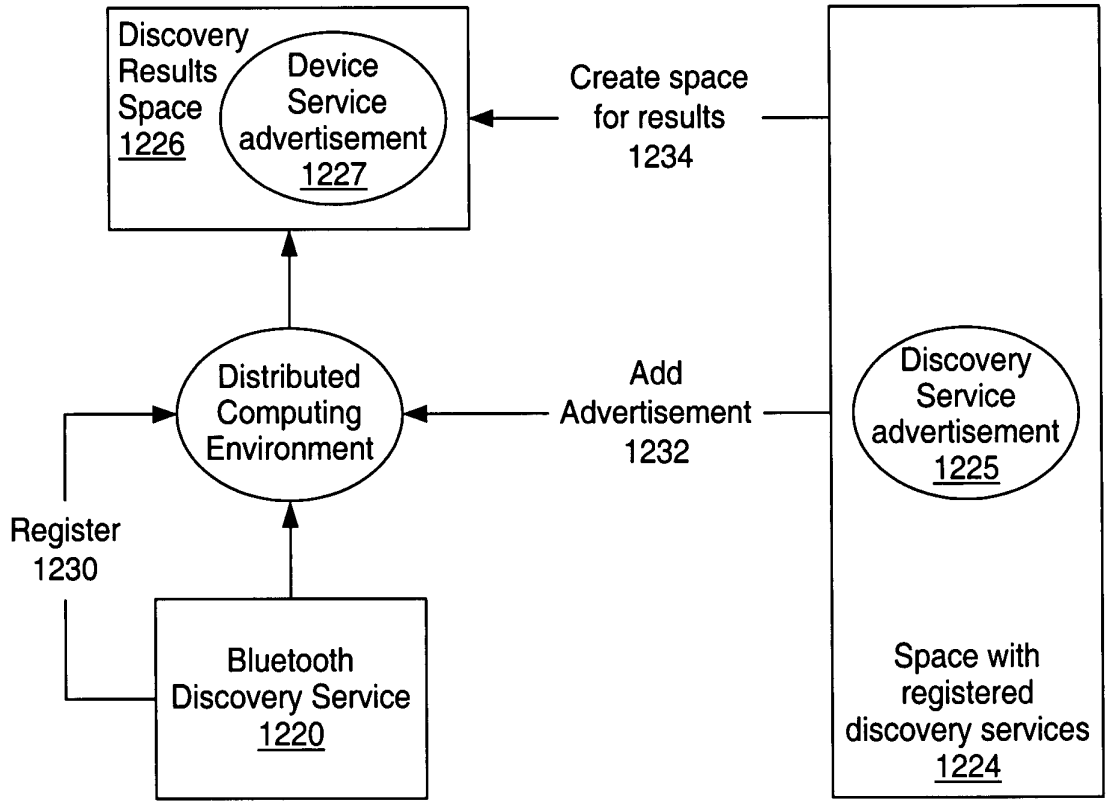
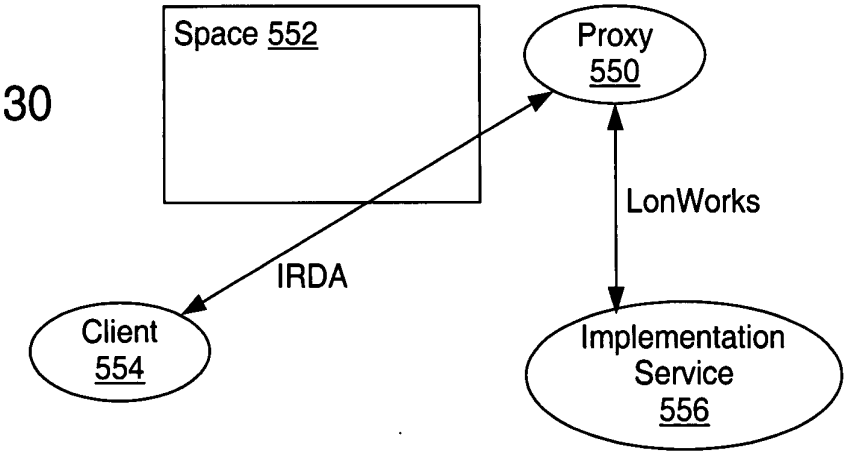

Discovery
Results
Space
1226
Device
Service
advertisement
1227
Create space
for results
1234
Distributed
Computing
Environment
Add
Advertisement
1232
Discovery
Service
advertisement
1225
Register
1230
Bluetooth
Discovery Service
1220
Space with
registered
discovery services
1224

Fig. 28

Fig. 30


Space 552
Proxy
550
LonWorks
IRDA
Client
554
Implementation
Service
556

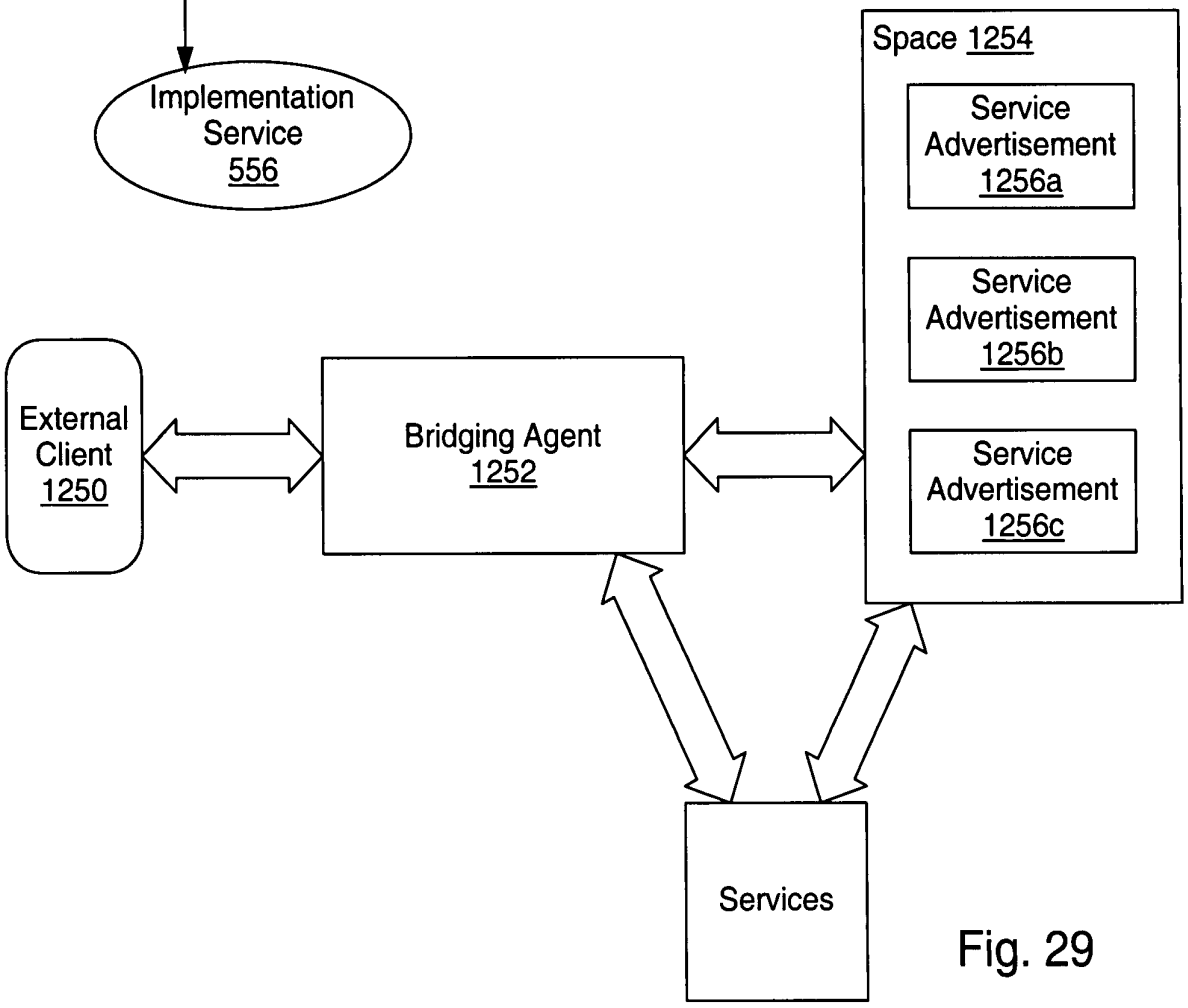

Space 1254
Service
Advertisement
1256a
Service
Advertisement
1256b
Service
Advertisement
1256c
External
Client
1250
Bridging Agent
1252
Services

Fig. 29

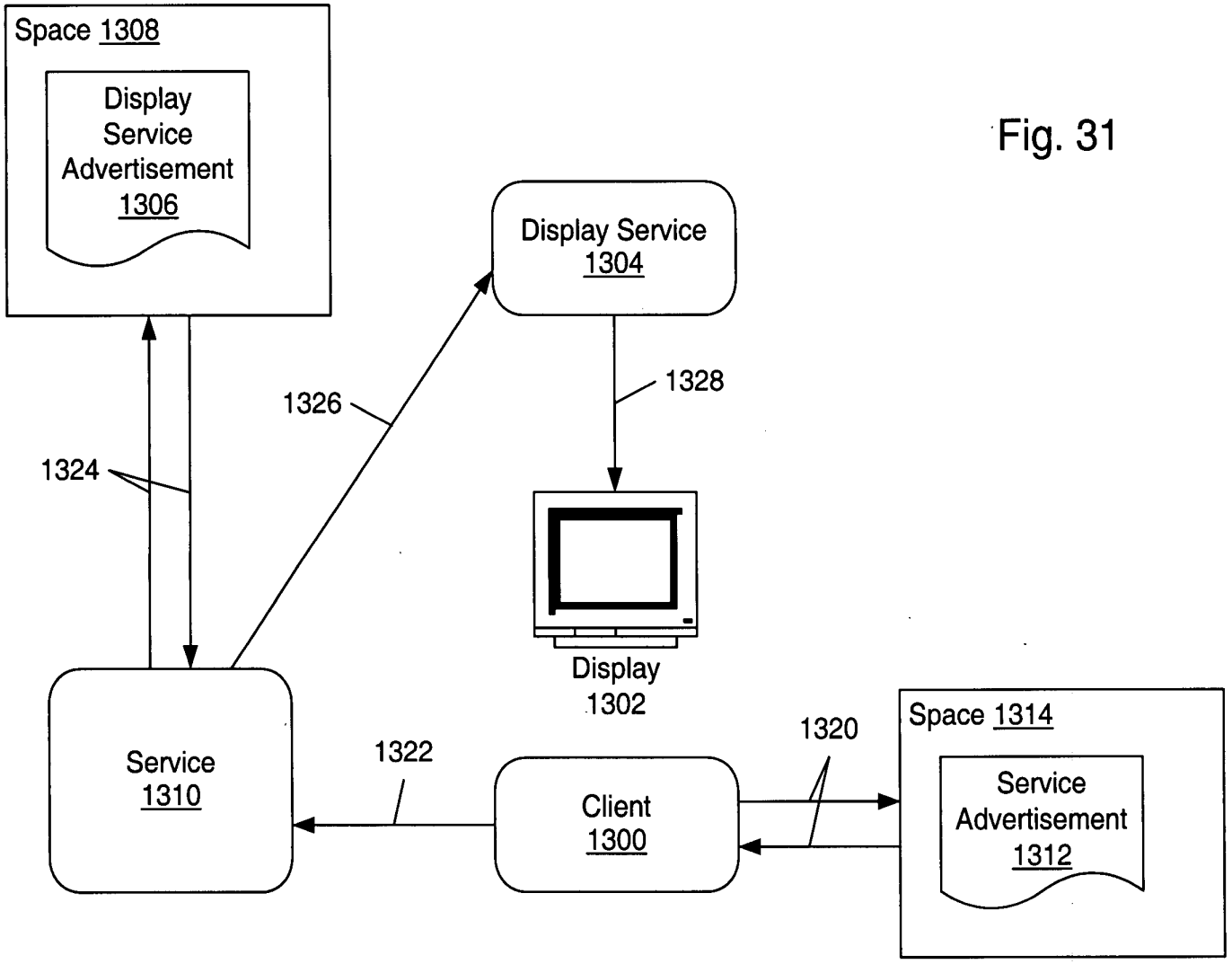

Space 1308
Display Service Advertisement 1306
Display Service 1304
1326
1328
1324
Display 1302
Service 1310
1322
Client 1300
1320
Space 1314
Service Advertisement 1312

Fig. 31

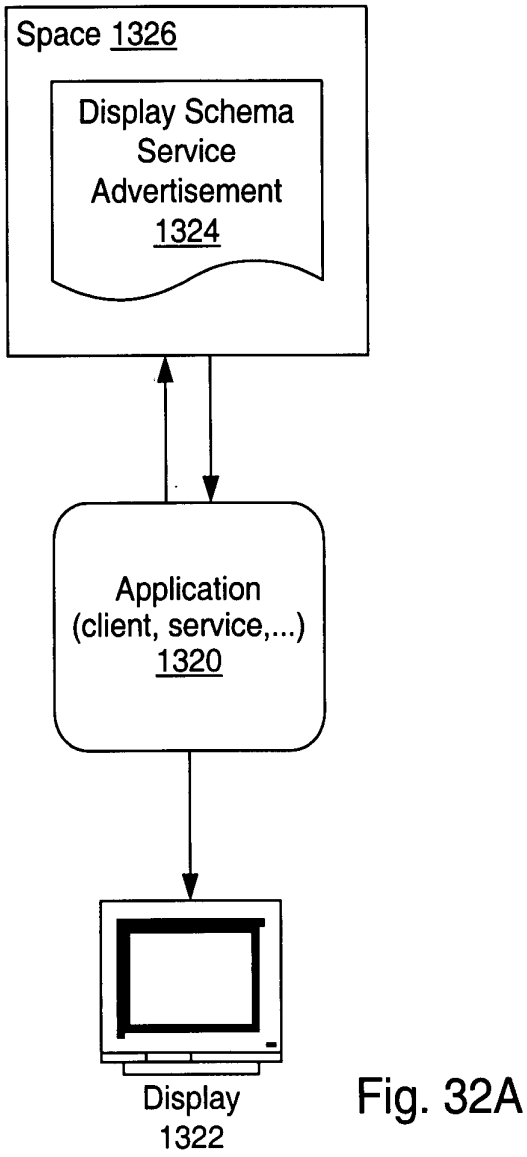


Fig. 32A

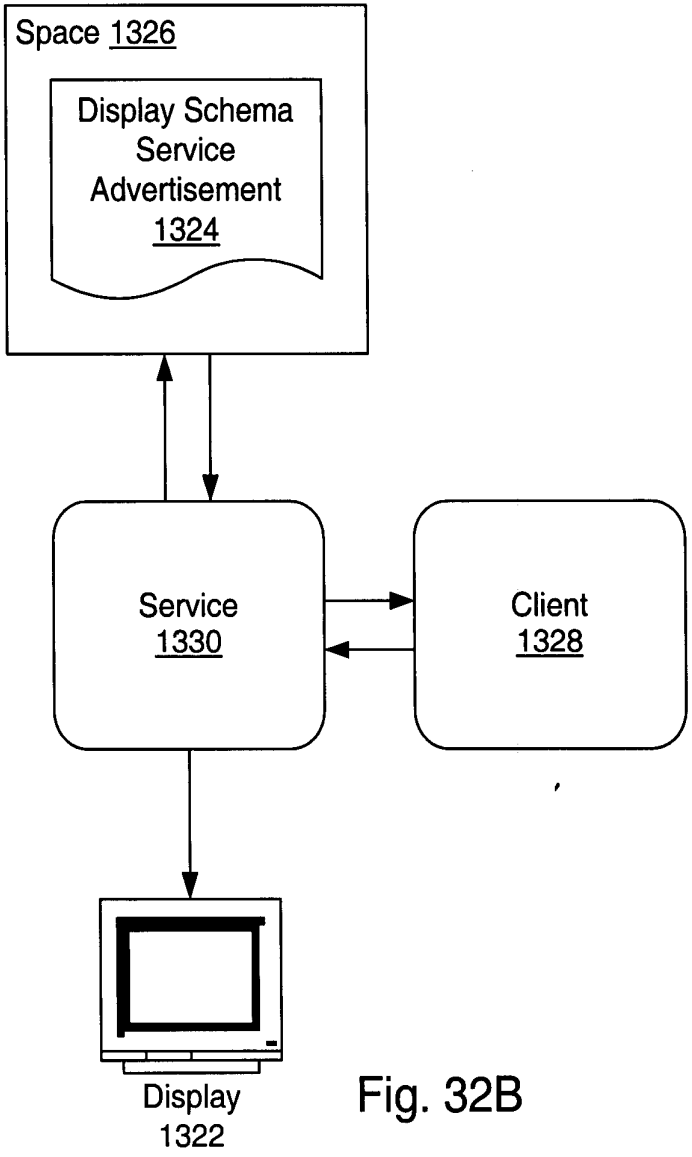


Fig. 32B

09604562.090200

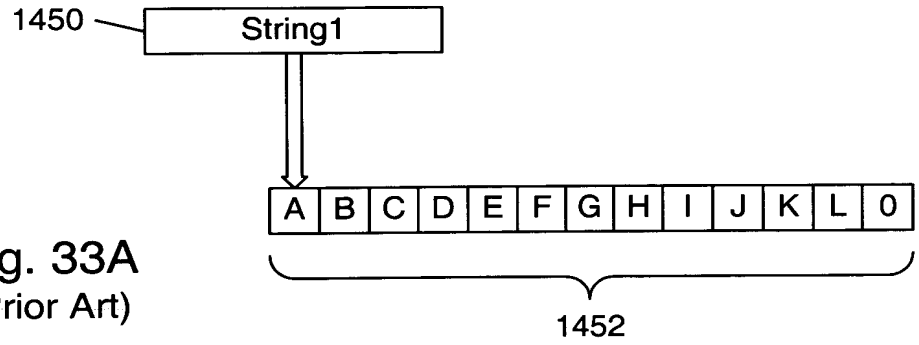


Fig. 33A
(Prior Art)

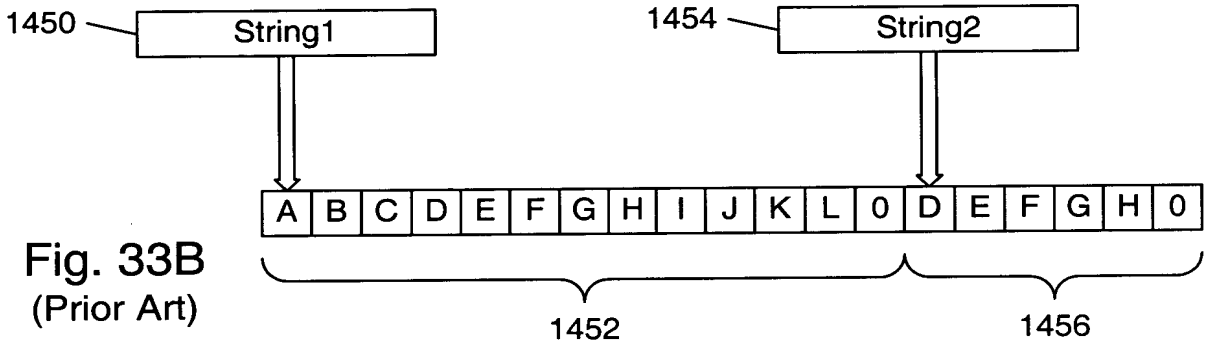


Fig. 33B
(Prior Art)

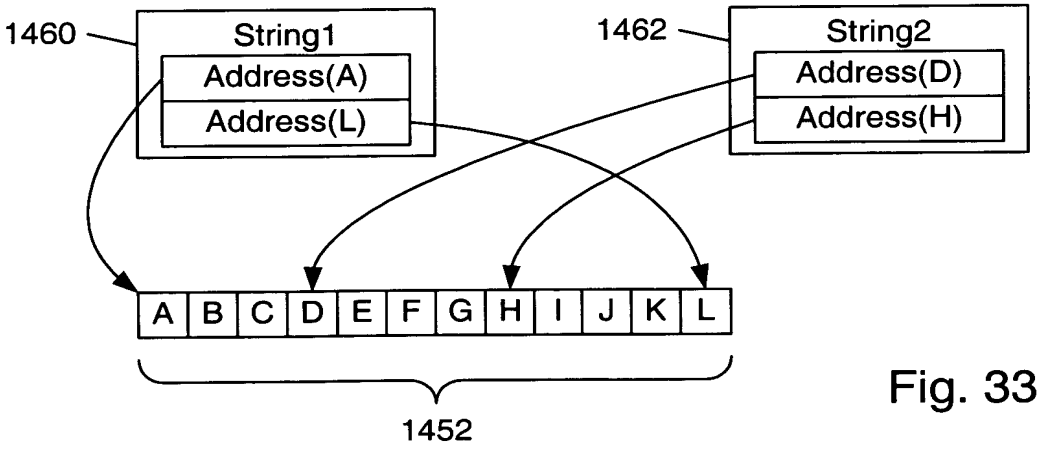


Fig. 33C

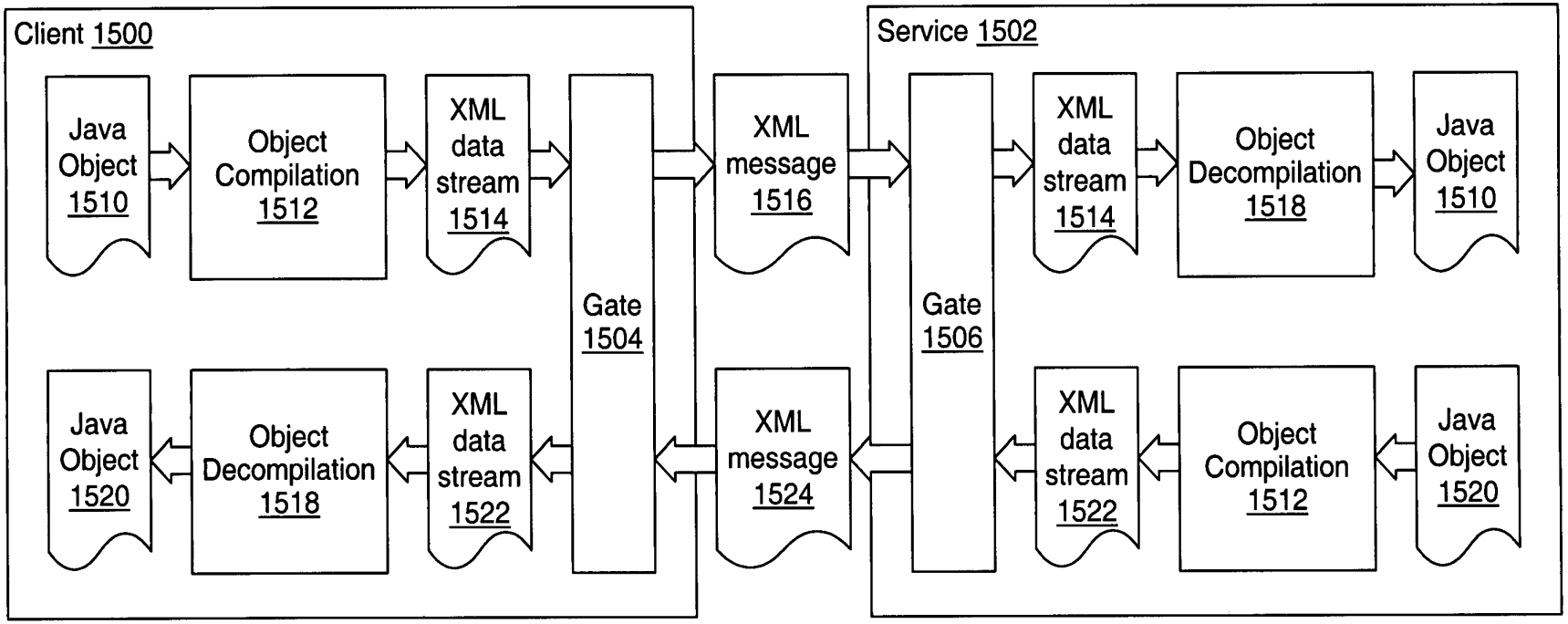

Client 1500
Java Object 1510
Object Compilation 1512
XML data stream 1514
Gate 1504
XML message 1516
Service 1502
Gate 1506
XML data stream 1514
Object Decompilation 1518
Java Object 1510
Java Object 1520
Object Decompilation 1518
XML data stream 1522
XML message 1524
XML data stream 1522
Object Compilation 1512
Java Object 1520

Fig. 34

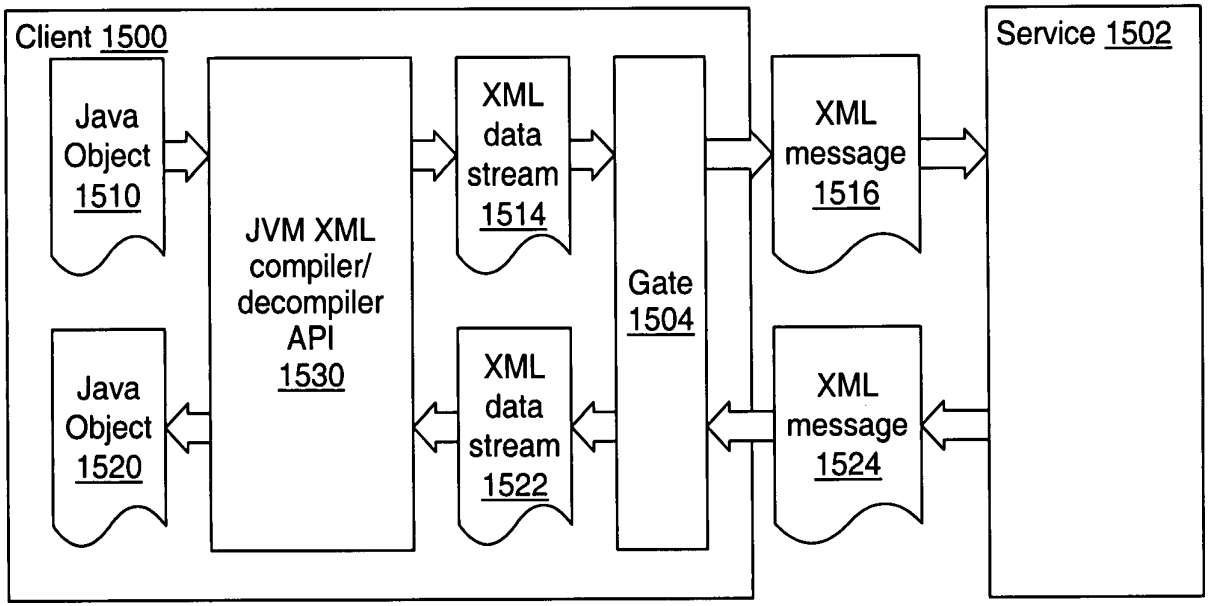


Fig. 35a

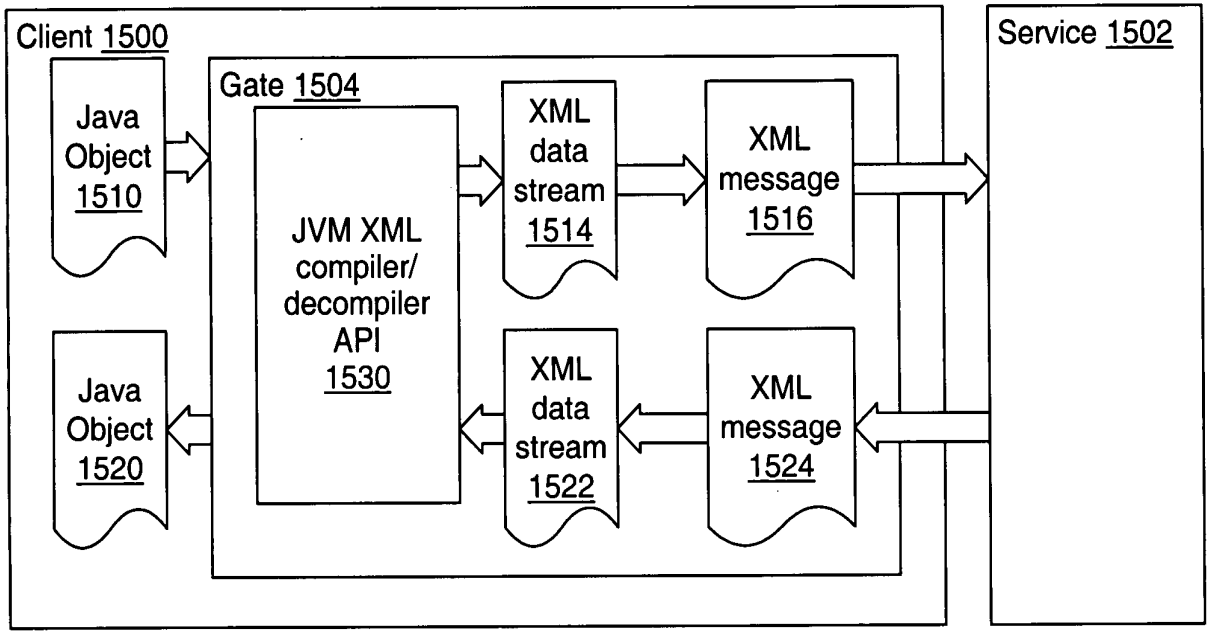


Fig. 35b

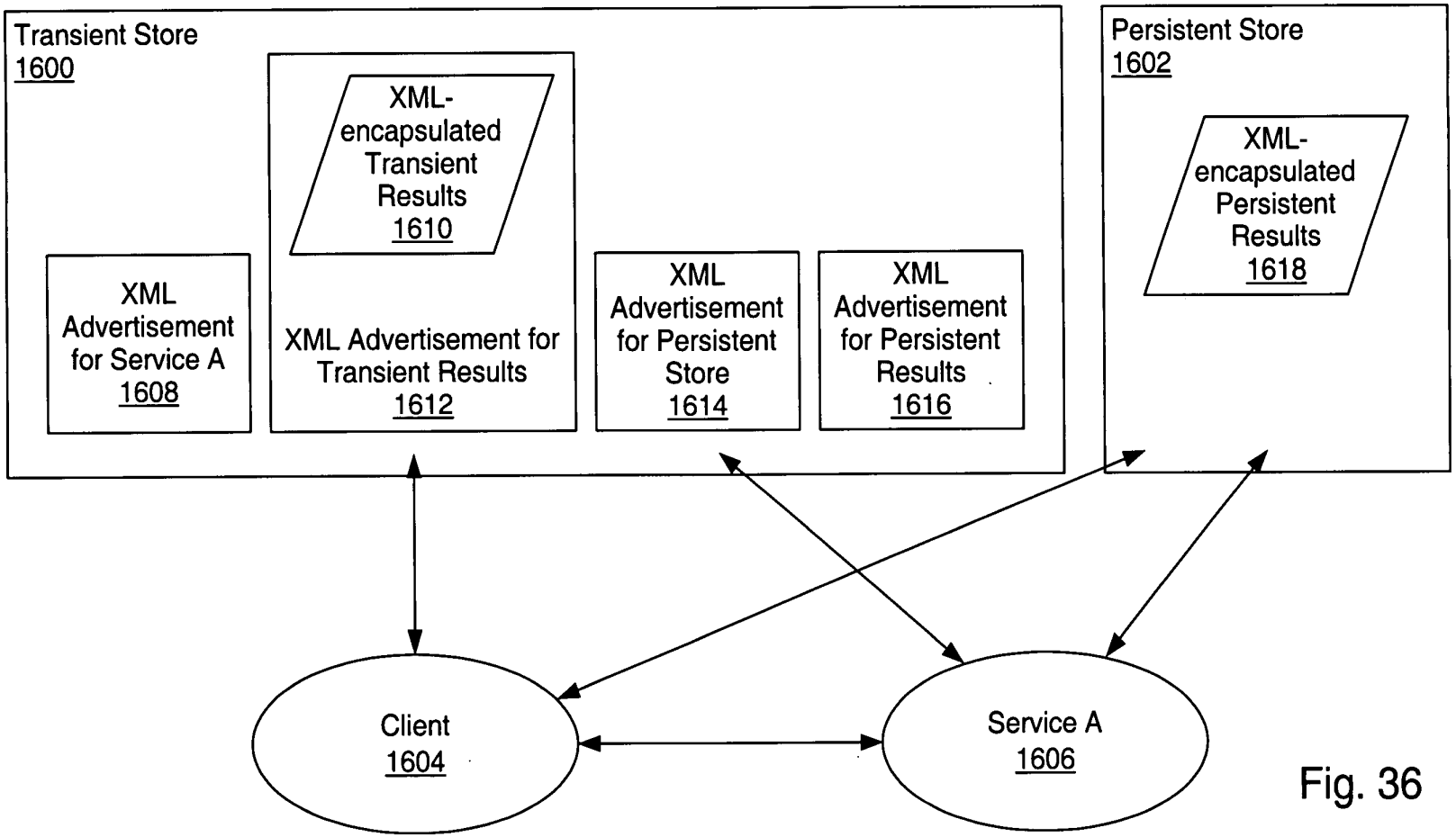

Transient Store
1600
XML-encapsulated Transient Results
1610
XML Advertisement for Service A
1608
XML Advertisement for Transient Results
1612
XML Advertisement for Persistent Store
1614
XML Advertisement for Persistent Results
1616
Persistent Store
1602
XML-encapsulated Persistent Results
1618
Client
1604
Service A
1606

Fig. 36

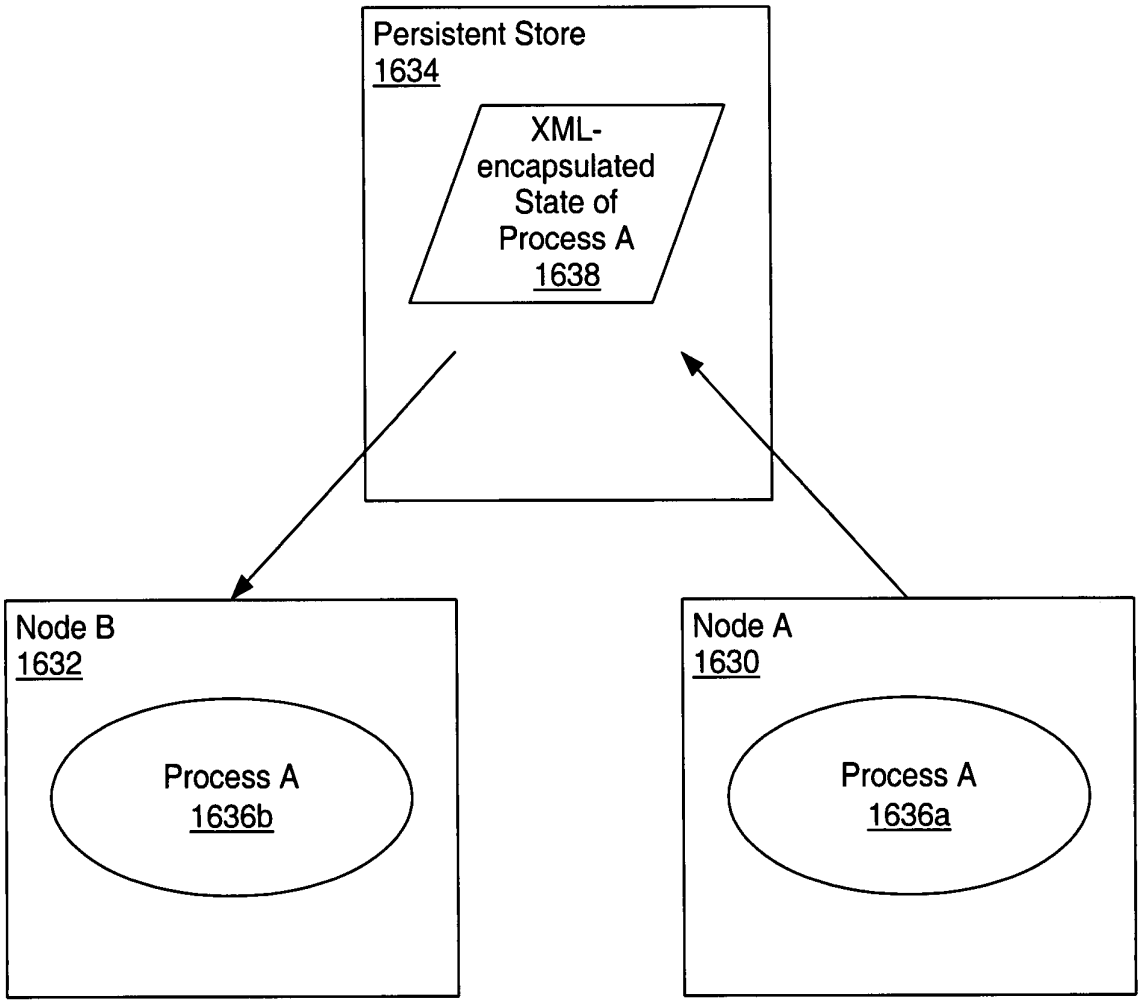

Persistent Store
1634
XML-encapsulated State of Process A
1638
Node B
1632
Process A
1636b
Node A
1630
Process A
1636a

Fig. 37

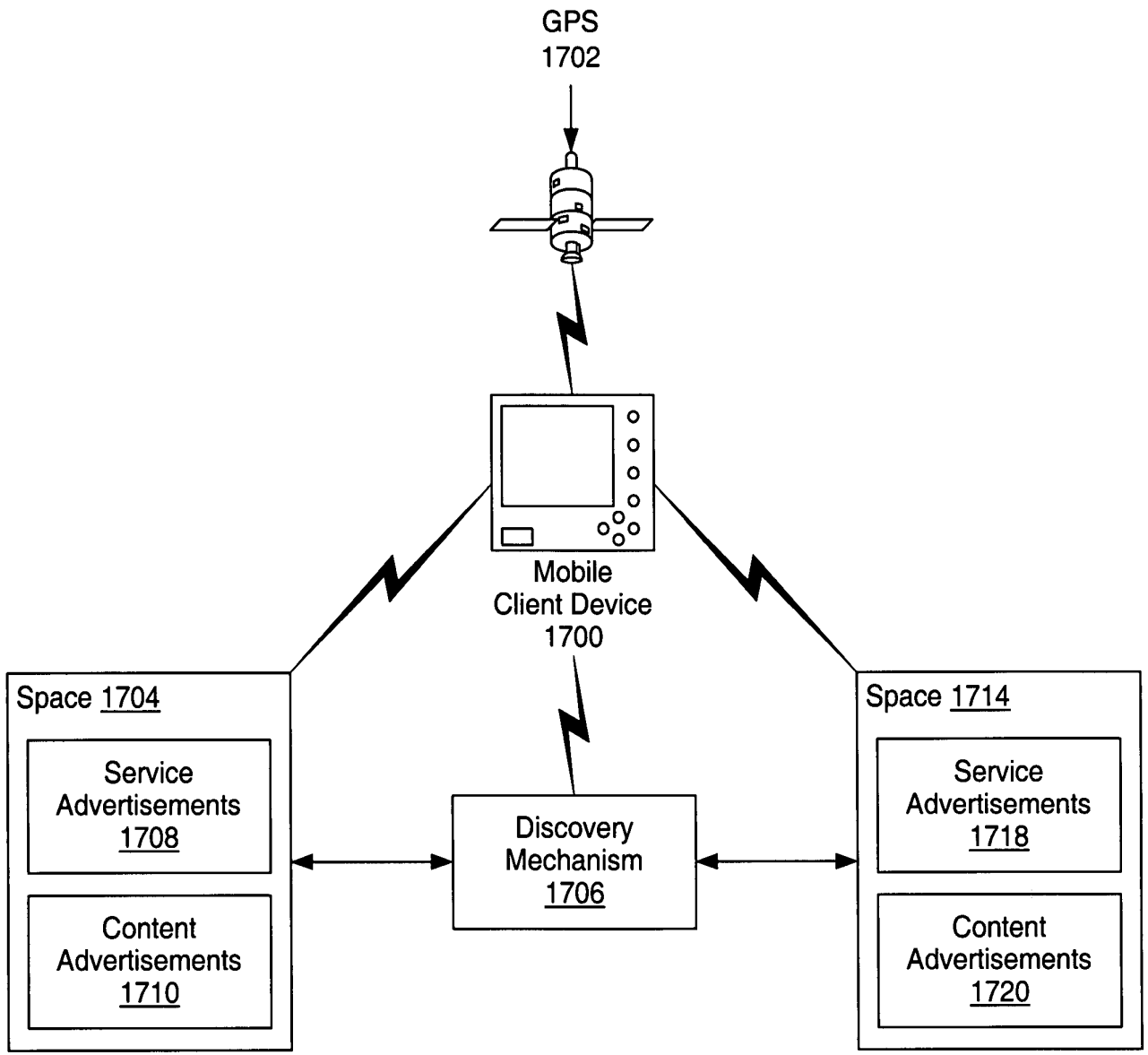

GPS
1702
Mobile
Client Device
1700
Space 1704
Service
Advertisements
1708
Content
Advertisements
1710
Discovery
Mechanism
1706
Space 1714
Service
Advertisements
1718
Content
Advertisements
1720

Fig. 38

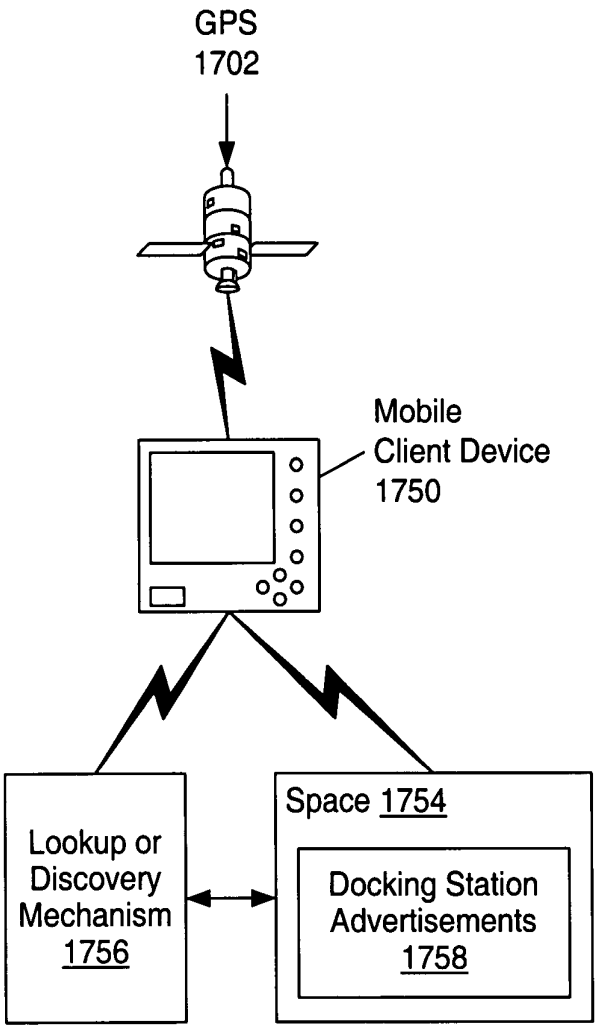


Fig. 39a

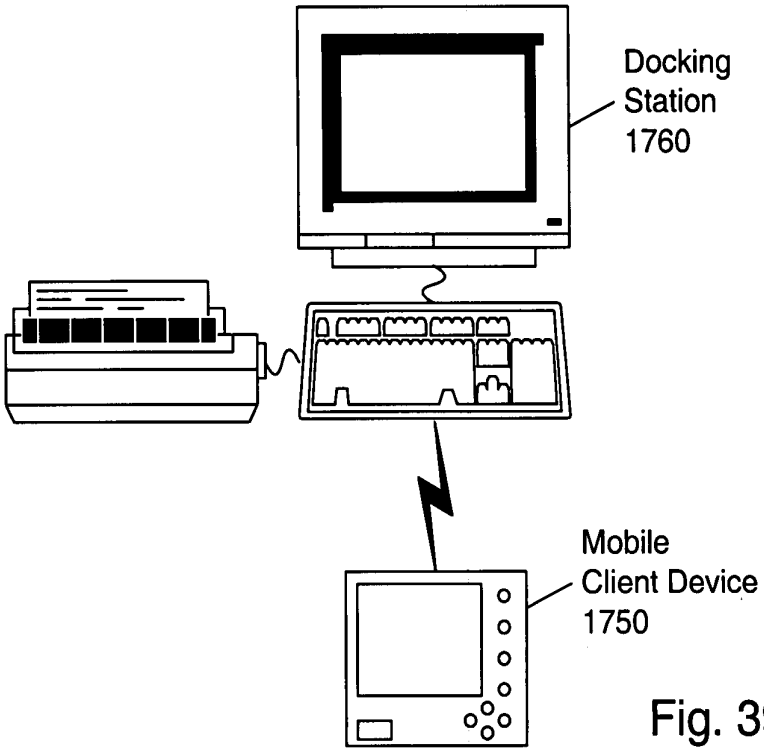


Fig. 39b

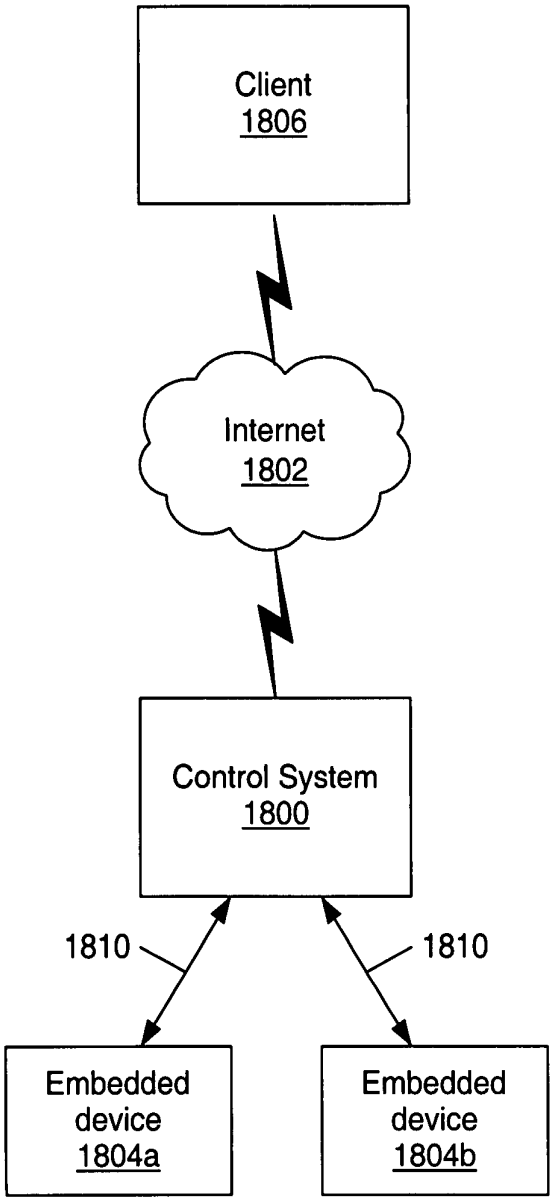


Fig. 40a

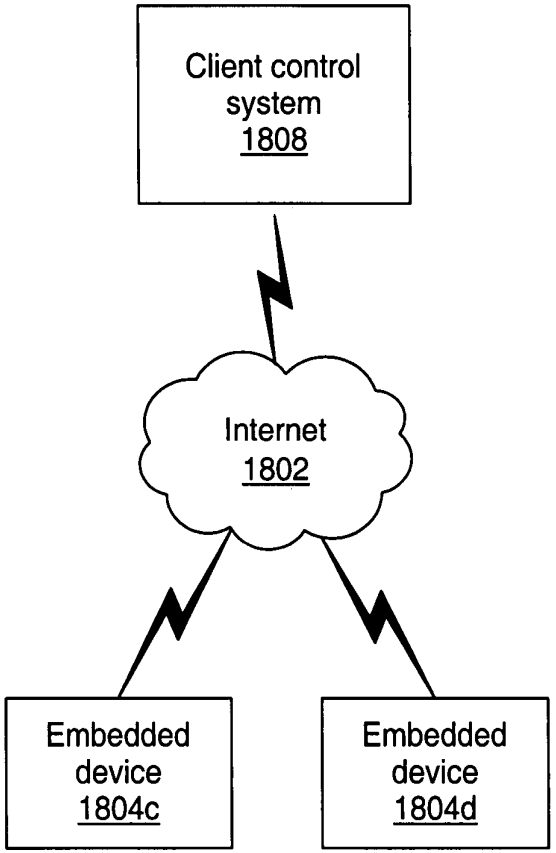


Fig. 40b

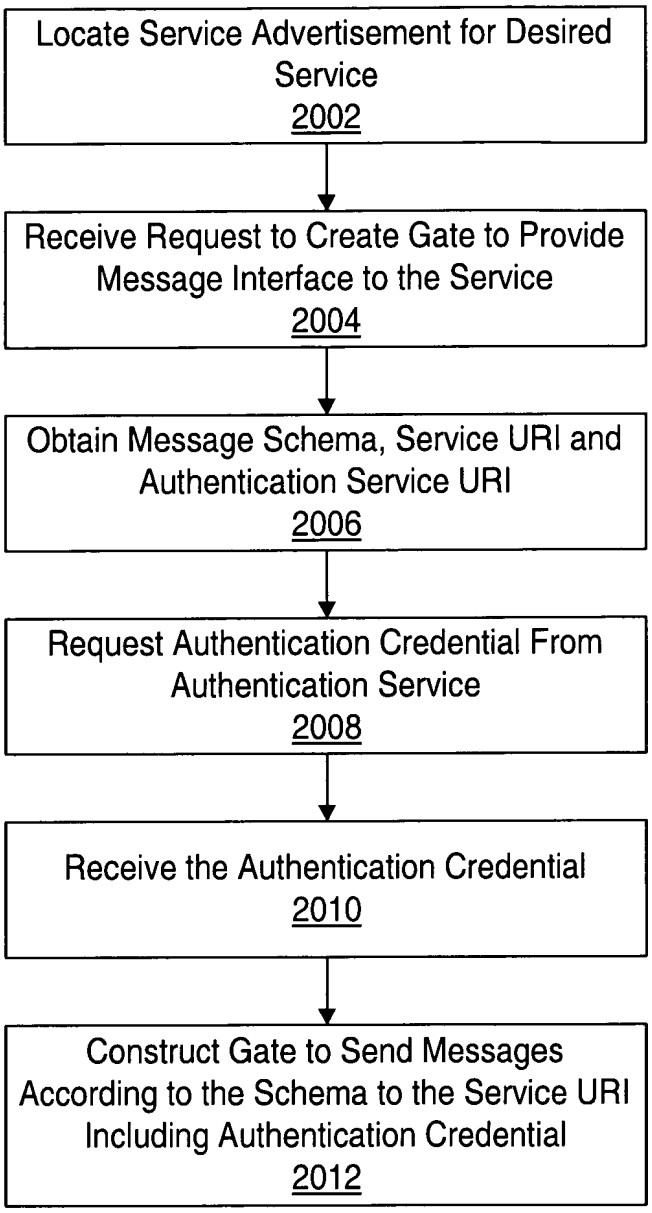

Locate Service Advertisement for Desired Service
2002
Receive Request to Create Gate to Provide Message Interface to the Service
2004
Obtain Message Schema, Service URI and Authentication Service URI
2006
Request Authentication Credential From Authentication Service
2008
Receive the Authentication Credential
2010
Construct Gate to Send Messages According to the Schema to the Service URI Including Authentication Credential
2012

Fig. 41

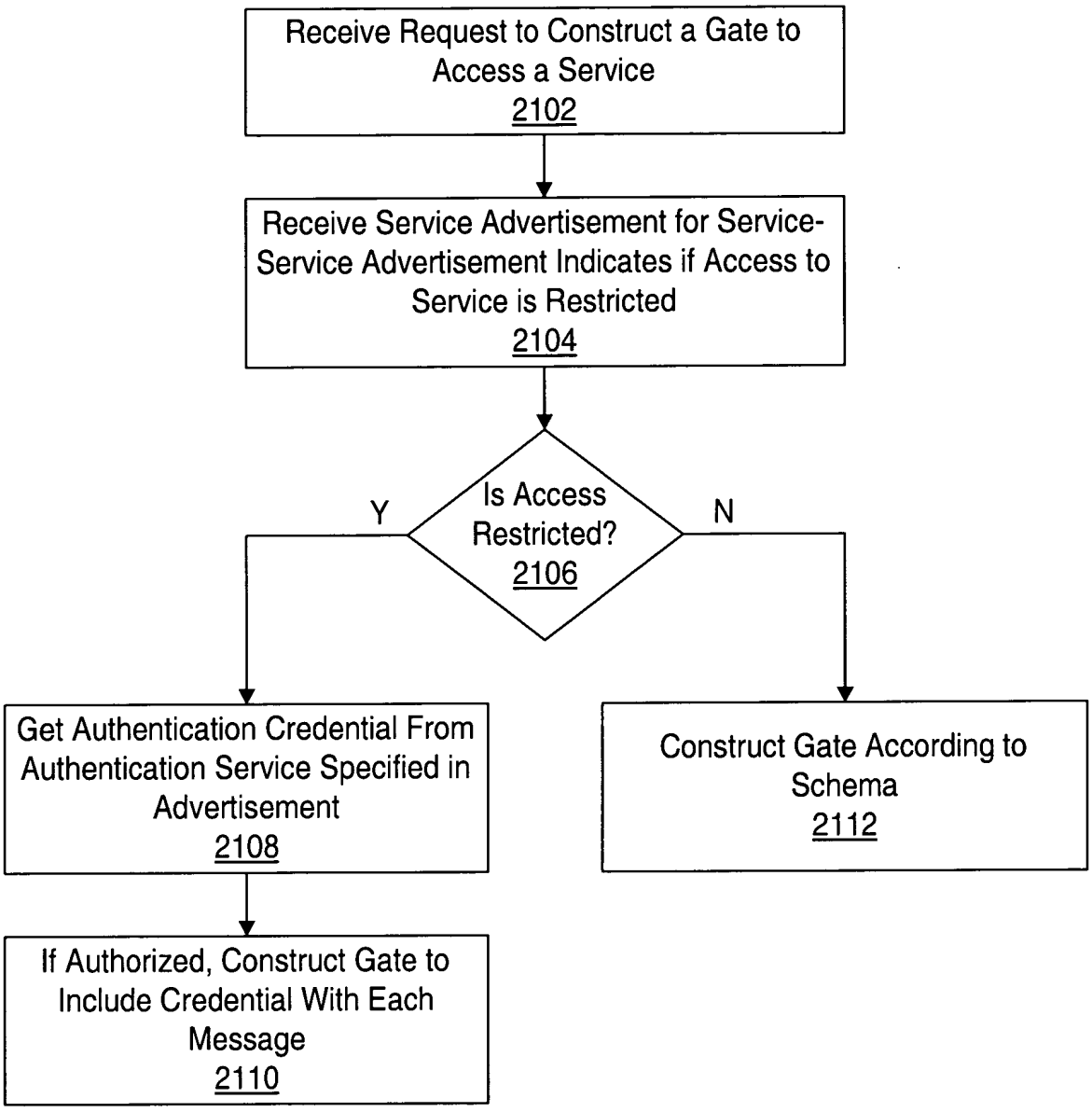

Receive Request to Construct a Gate to Access a Service
2102
Receive Service Advertisement for Service-Service Advertisement Indicates if Access to Service is Restricted
2104
Is Access Restricted?
2106
Y
N
Get Authentication Credential From Authentication Service Specified in Advertisement
2108
If Authorized, Construct Gate to Include Credential With Each Message
2110
Construct Gate According to Schema
2112

Fig. 42

09666562.094200

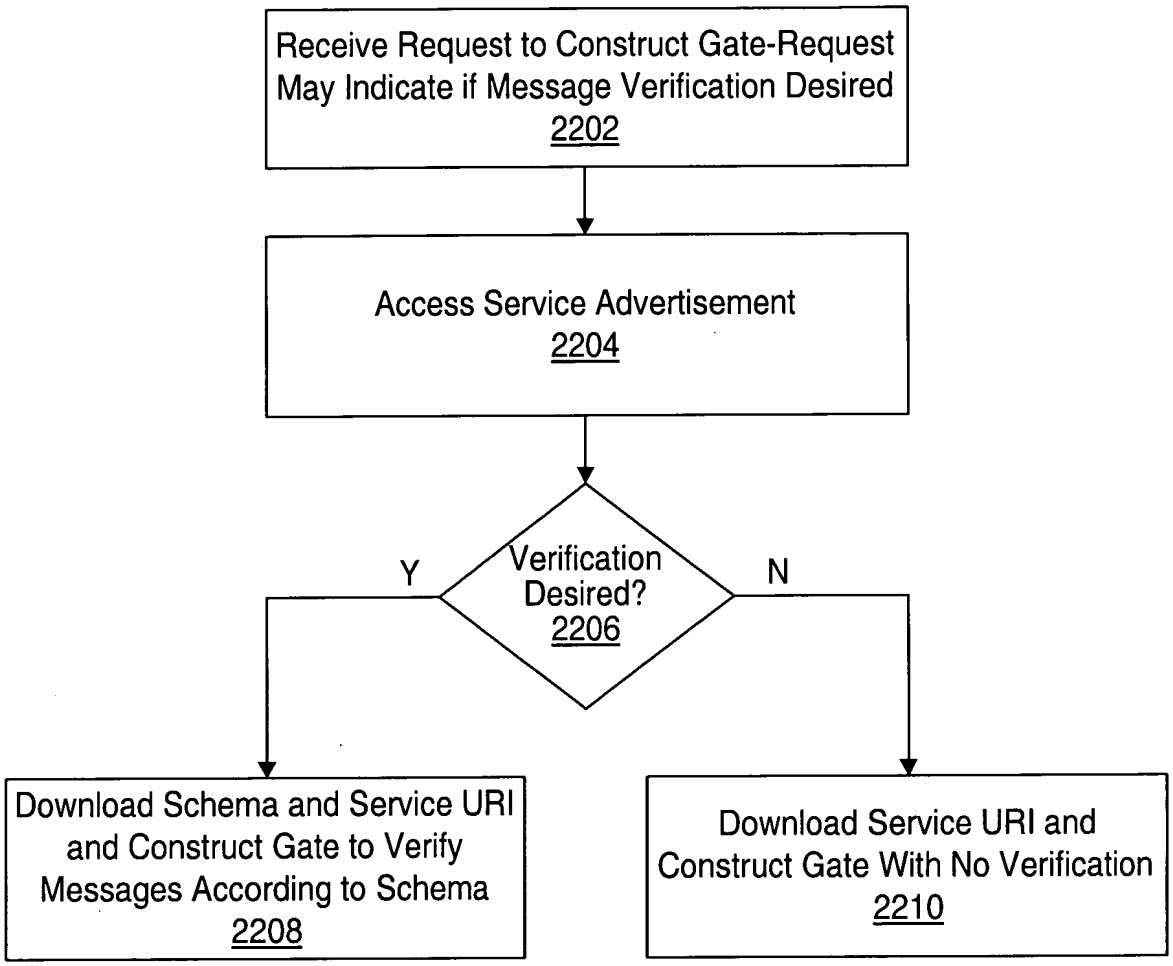


Fig. 43